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LIVESTOCK AND THEIR ENVIRONMENTS : SUNLIGHT AND VITAMIN D

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PART III

Summary

The influence of factors such as methods of crop production and animal breeding programmes is discussed from the aspects of the vitamin D status of livestock in Britain. It is contended that there will be greater need for correlation of these various factors in the future than has hitherto been the case.

After a survey of clinical and other relevant evidence it is considered that some degree of avitaminosis D is likely to occur in livestock in these islands under normal conditions of management. As a corollary, the contention that an absolute phosphorus deficiency, as distinct from impaired absorption and utilisation, is the direct cause of herd infertility in dairy cattle is regarded as not proven on the evidence so far presented.

Before a statement of the general conclusions which have been derived from the subject matter of this series of papers, a short section dealing with the wider possible relationships between livestock and their environment is included. That animal nutrition is an evolutionary process and one to which increasing attention must be paid if the present drive for increased animal production is to continue is the chief point put forward for discussion.

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(6) ANIMAL HUSBANDRY IN RELATION TO VITAMIN D

In the opening paragraph of Part I of this series (Abrams, 1952a) emphasis was given to the importance of correlating the living animal with the whole and not merely a part of its environment. The complex relationships between vitamin D, calcium and phosphorus prove clearly that sunlight and the vitamin do not function independently in mammalian metabolism. There follows the problem of the number of major variables which need to be taken into account.

Much of the evidence is conveniently covered by the term "animal husbandry." It will be discussed under the following sub-headings, (*a*) the nature of the animal, (*b*) animal management, excluding feeding, (*c*) crop production for livestock and, to round off the whole subject, (*d*) a survey of data which tend to show the existence of avitaminosis D in livestock in Britain.

(*a*) *The nature of the animal.*

Estimates of the amount of vitamin D which might be formed in the skin of a 1,000-lb. beast by the action of direct sunlight (Abrams, 1952b) were based in part upon laboratory experiments where shaven albino rats were irradiated with ultra-violet rays. Two important matters now requiring assessment are, firstly, whether the vitamin D which is formed is equally well used by animals of different species, and, secondly, whether differences of skin texture and pigmentation influence the amounts of vitamin D formed by equal exposures to sunlight.

At present there seems to be no evidence that the vitamin D precursor found in the skin of mammals differs from one species to another. It is of course a subject upon which more information might be desirable. On the other hand, even though there were indeed slight differences between the chemical constitutions of the precursors, leading to the consequent formation of different vitamins D, the data of Gridgeman (1945) and others, showing that the activities of vitamins D_2 and D_3 for a selected mammalian species are almost equal, are reassuring.

So far as skin pigmentation is concerned, for so long has it been known that negroes and other dark-skinned peoples living in the temperate zones are much more prone to suffer from rickets than the light-skinned natives of those regions, that it is difficult to find the original reference to the phenomenon. What appears to be far less familiar is that the effect extends to livestock. The American workers Johnson and Palmer (1941) established the truth of this for different coloured breeds of pig ; a similar observation has been made in this country (Blount, 1951). Dark-skinned horses (Hawthorne, 1941) and black kittens (Schnelle, 1940), as well as rats have been the object of similar observations.

Doubts have been expressed by certain workers as to whether melanin itself is the factor which leads to a greater incidence of rickets in negroes removed from their natural habitat to the temperate zones. One can scarcely credit, however, that social and economic agencies, which may well be other contributory factors in the case of man, can operate for pigs and other livestock. The way in which melanin may act has thus to be considered.

So far as heat tolerance is concerned, melanin in the skin is probably disadvantageous (Blum, 1945) : on the other hand, the pigment could be a valuable defence against excessive ultra-violet radiation, which has a destructive effect on cell proteins but which is absorbed by melanin. The energy of the ultra-violet rays might well be dissipated in the form of heat, but such dissipation would in itself provide but a minor additional heat load for the animal body, seeing that the short-wave energy of sunshine constitutes no more than a small fraction of 1 per cent. of the total radiant energy.

Now in man and probably in other mammals, vitamin D is almost certainly formed in the outermost layers of the skin. On the exposure of the human being to ultra-violet light the existing melanin migrates outwards into the corneum : some little time later the pigment is formed in greater amounts in the epidermis. Melanin is thus in a position to absorb ultra-violet rays.

Assuming that the pigment interferes with vitamin D synthesis, it follows that when the negro moves into the poorer sunshine of the temperate zones his inherited cutaneous defences against excessive irradiation now prevent the formation of adequate amounts of vitamin D. The same argument applies to pigmented animals, but it does not imply, of course, that melanin prevents all vitamin synthesis, nor that the amounts of melanin or the degree of interference is the same in all individuals. (An alternative or supplementary hypothesis to this is given in section 7 of this paper.)

Bonsma (1948) has suggested that a white, yellow or red coat with a dark hide is an excellent combination for mammalian resistance to tropical heat and light : in Indian and Afrikaner cattle and in Arabian horses such combinations are to be found. Although light hair has the advantage for the

tropics of reflecting appreciably more sunlight than dark, even here pigmentation may produce measurable effects, for Bonsma and Pretorius (1943) attributed the greater reflection of sunlight by a particular cream beast than by a white one to the *melanin-tipped* hair of the latter. Bonsma (*op. cit.*) also suggests that black-skinned cattle are best suited to regions where short-wave rays are intense and temperatures are moderate, as at high altitudes in tropical regions. There is no doubt, however, that Mediterranean-type climates also fall into this category quite well. Since some geneticists (Mason, 1951) now believe the black (Berkshire) pig, unlike the light breeds, to be partly of Mediterranean origin, so that its ancestors were accustomed to sunshine of high potency, the relationship of skin colour to vitamin D synthesis is therefore no mere academic problem, particularly in the temperate zones. Although cod-liver oil is commonly incorporated in the diet of pigs in Britain, especially during the winter months, there are other species of livestock, the thoroughbred or Arab horse being one, which may also be of tropical or sub-tropical origin and for which no corresponding provision is made. The liability of horses to bone disease here may be a relevant problem, even though trauma and other adverse circumstances may also provide additional contributory causes.

Lastly, one of the arguments, though far from conclusive, which may be put forward in favour of the hypothesis that the formation of vitamin D by solar irradiation is basically the same in many animals, rests on the observations of Laurens and Mayerson (*op. cit.*), who found that the amounts of ultra-violet energy per sq. cm. of body surface required to prevent the onset of rickets in creatures as diverse as the unpigmented, albino rat and the chick, were almost equal. Furthermore, that the work of Knudson and Banford (*op. cit.*) should have been on the irradiation of unpigmented, albino rats, implies that the estimated values of sunlight for the larger, pigmented species are the highest probable ones. In particular the estimate for the 1,000-lb. beast (Abrams, 1952b) is generous.

(*b*) *Animal management, excluding feeding.*

Animal production methods have tended to change greatly during the last two decades, both in Britain and in the U.S.A. In this country the drive for more intensive production has led to attempts to obtain higher milk yields from dairy cattle, more rapid growth of meat-producing animals and greater egg yields from fowls. The sow is now expected to produce both an autumn and a spring litter and to continue to do so in successive years. To achieve a more uniform milk supply during the year, autumn calving has become increasingly common in dairy herds.

More rapid gain of weight in young stock implies a greater body-load on the growing limb-bones. It may be for this reason that the severe bone deformity in pigs observed by Blount (*op. cit.*) and the lameness recorded by Hastings (1942) occurred in highly fed animals.

Apart from the quest for speedier growth, autumn breeding brings its own special problems. Not only has an autumn-born beast to withstand the damp and coldness of winter but, in addition, either it is exposed to a winter sunshine much less potent than that of summer or, worse still from the point of view of irradiation, it may be housed for the whole of the winter months. Reference to increased winter incidence of rickets in cattle (Hibbs *et al.*, 1945), sheep (Ewer, 1950 ; Ewer & Bartrum, *op. cit.*), horses and pigs, in England, New Zealand and the U.S.A., is to be found in recent reports. Difficulties have also been reported in the rearing of autumn-born puppies (Bateman, 1952) and kittens (Scorgie & Abrams, 1952) in Britain.

Protection against rickets or diminished growth in the calf, for example, is provided by (i) a good Ca/P ratio in cow's milk, (ii) vitamin D reserves of the young animal at birth, (iii) the vitamin D content of milk and (iv) solar irradiation, if this be possible. The vitamin D reserves of the autumn-born calf are probably better than those of the spring-born animal ; few quantitative data seem to be available, however. In attempting to assess the value of the other factors, the data of Henry and Kon (1942) on the vitamin D content of milk and the vitamin D producing powers of direct sunlight calculated (approximately) on a basis of 100 lb. liveweight (Abrams, 1952b) may be used. The comparative positions of spring and autumn-born animals, respectively, may then be seen from the following table :—

	Spring-born calf	Autumn-born calf
1. Vitamin D reserves at birth	?	?
	(The few recorded data show 0 to 50 I.U. per 100 grammes of liver)	
2. Average vitamin D content of cow's milk during six months after parturition, in I.U. per gallon.	60	60
3. Average daily value of direct sunshine, in I.U. of vitamin D per 100 lb. liveweight.	(May to September)	(October to April)
Latitude 50° N.	2,000 to 4,600	800 to 1,800
Latitude 60° N.	1,400 to 2,800	400 to 800

The data show, rather surprisingly perhaps, that the vitamin D content of milk seems to be comparatively unimportant. Furthermore, the autumn-born calf, without possessing large initial reserves of vitamin D, is probably better off than the spring-born animal. On the other hand, the value of " summer " sunlight for the beast born in season is two or three times as great as that for the autumn-born calf. Even for the latter, however, sunshine apparently provides adequate vitamin D (see Section 6*d*) were it not for two factors. Firstly, two thirds of all the value of " winter " sunlight is concentrated into the initial and final months of the period, the remaining four months providing very little. In order to benefit, therefore, the calf should enjoy the early winter sunshine, otherwise there follows a sunless period. Secondly, calves are likely to be housed during all of the winter months.

When one turns from the requirements for growth to those demanded by modern levels of lactation in the dairy cow the problem becomes still more interesting. A cow which is giving just over 2 gallons of milk per day is metabolising foodstuffs at about twice the rate which would suffice for its simple maintenance ; a young animal at its period of greatest growth rate is in a like position. The metabolic requirements for milk yields of 4, 6 or more gallons per day can thus be compared only with fantastically high and purely hypothetical growth rates. Moreover, the adult cow, unlike the young animal, which progressively diverts more of its energy to maintenance and less to new growth, is expected to keep up this metabolic rate for months on end and, with rather short rest periods, even for years.

In mammals, though the environment of the young animal is changed at birth, one may not unreasonably regard lactation in the dam as being akin to those metabolic changes which occurred in the growth of the foetus *in utero*. Young (1951) and others have stressed the part played by the growth hormone, perhaps through the suppression of oxidation

mechanisms, in lactation in cattle. What is important here is not so much the nature of the endocrine mechanism involved as the intensity of the "growth" and the magnitude of the hormonal disturbance which may be involved.

Now some of the carnivora, including dogs, appear to show great sensitivity to slight deviations from the optimum calcium-phosphorus ratio of the diet and to need disproportionately large amounts of vitamin D for the correction of such imbalances. One might seem to be dealing with a phenomenon characteristic of the carnivora alone, so that inter-species comparisons of calcium-phosphorus-vitamin D relationships would be of very doubtful validity, if it were not for the fact that the more rapidly growing breeds of dog, such as Great Danes, are the animals which are most sensitive (Morgan, 1940). Sensitivity to calcium-phosphorus imbalance thus loses much of its appearance as a characteristic of particular species and seems more and more to be an attribute of rapid growth. If, therefore, there are physiological parallels between rapid growth and heavy lactation, one might expect to find the high-yielding dairy cow to have greater need of vitamin D under field conditions than the less productive animals. Here "high-yielding" is used mainly for comparisons of modern domestic animals with their natural counterparts.

Another view of lactation is that of the turnover of the elements calcium and phosphorus, with the metabolism of which vitamin D is concerned. There is as yet no conclusive opinion as to the amounts of the two elements which are needed for the maintenance of a cow, but it seems improbable that the Ca/P ratio involved is appreciably more than 1 : 1. Furthermore, the ratio of the weights of the elements found in the milk of the cow is only slightly greater than unity. In numerous cases, not limited to the cow, it has been shown that when the adult mammal retains or loses calcium and phosphorus over a reasonably long period, the Ca/P ratio concerned is usually stabilised at about 2 : 1, *i.e.*, approximately the ratio in which the two elements occur in bone. Simply to say that the elements are "stored in the bones" is to overlook the biochemical mechanism which makes the process possible and to ignore its dynamics. One wonders how during long periods of time this characteristic 2 : 1 ratio can be made compatible with the excretion of large volumes of milk in which the ratio of calcium to phosphorus approaches unity, what disturbance of calcium metabolism is involved and how vitamin D is concerned.

Following the work of Forbes and his collaborators (1935) it has come to be accepted as "natural" that the dairy cow should be in negative calcium and phosphorus balance at the peak of lactation, losing more of these elements in faeces, urine and milk than can be absorbed from the ration, even when some vitamin D is given to the animal. Some of the experimental evidence upon which these opinions have been based was done before the significance of the vitamin was fully realised. In Forbes' experiments, for example, it appears (it has not been possible to consult the original paper) that the cattle were housed for a continuous period of 12 months, successive 28-day balance-trials being made throughout. Although hay was given to the animals, the later comments on the work of Meigs and his collaborators may also apply here. If heavy lactation is in some ways akin to rapid growth, it is possible that higher intakes of vitamin D may be needed to maintain positive or only very slightly negative balances during lactation than have hitherto been tried.

(*c*) *Crop production for livestock.*

A process which began just before 1919 but which was greatly accelerated by the advent of the last war was the attempt at greater self-sufficiency in the production of food both for human beings and for livestock.

As examples of "new" crops there are sugar-beet tops, sugar-beet pulp and kale, all tending to have a high ratio of calcium to phosphorus, nowadays being fed to livestock in large amounts. On the other hand, smaller quantities of oil cakes, rich in phosphorus, are available.

Probably the greatest change, however, is in the attitude towards grass as fodder, especially for cattle. On arable farming land in Britain there have always been large areas of long-established grassland, of varying and mostly poor quality, but grass, in the form of leys, is now used as a rotational crop.

When leys are compared with the above type of grassland, the following points of difference may be made : firstly, the number of plant species in the leys is much smaller than that found in permanent pasture ; secondly, "weeds," or "herbs," are excluded as far as possible from the ley ; thirdly, the characteristics of different plant species, with respect to soil penetration, etc., vary quite considerably so that a new ley may tap the underlying soil in a manner not previously accomplished by permanent grass ; and, fourthly, leguminous plants have found increasing usage in leys. Such leguminous plants flourish on lime-rich soils and, in consequence, are usually richer in calcium content than the grasses.

Changes in the nature of grassland are reflected not only in the composition of the grass *in situ* but also in that of the dried grass, hay or silage which may be derived from the pasture. Such changes are unlikely to affect the nutritional status of pigs very much but will have considerable bearing on that of cattle, horses and sheep.

Another decisive change has also occurred in grassland management. Though some consideration has indeed been given to carotene, a criticism of grass production which may justifiably be made is that production policy has tended to be dominated far too much by considerations of total yields per acre of digestible energy and of protein. In effect the search has been for particular nutrients rather than for food. Here, however, only matters relating to vitamin D can find place for discussion.

As has been pointed out already, high carotene and vitamin D contents in the same grassland product are apparently largely mutually exclusive. To over-emphasise carotene is to ignore vitamin D.

Thomas and Rogerson (1951), among others, have shown that some of the common herbs differ in their mineral contents from the usual mixtures of leys. The occasional escape of livestock from a new ley to an old pasture may perhaps find explanation in the above differences. At present, however, the real reason for an animal's preference for such plants cannot be identified with any particular chemical constituents.

Before dealing with two recent developments which concern vitamin D and the health of livestock and which may involve members of the steroid family, it is necessary to elaborate slightly what has already been said about this interesting group of chemical compounds.

That substances showing comparatively little differences in chemical structure should show such diversity of physiological properties as do the vitamins D, the bile acids, sex hormones, certain cardiac poisons, adrenocortical hormones and the simple sterols is surprising. Stranger still, in view of modern knowledge of biological antagonisms between compounds of closely related chemical structure, is the present lack of many examples of such antagonisms among the steroids. It may be, of course, that there has yet been no intensive search for them. Now Norman and Mittler (1948) have produced evidence that under certain conditions the male sex hormone may show rachitogenic properties while the female sex hormone is antirachitogenic. The existence of inter-relationships between the two groups of steroids, rather than

which particular hormone is antirachitic, is the significant matter.

Of the two recent developments the first concerns the introduction into Australia some years ago of the subterranean clover (*Trifolium subterraneum*). In many instances the plant soon constituted the greater part of the sward. Progressively more serious reproductive disorders were subsequently observed in sheep grazing the new pasture, although cattle and horses seemed to be unaffected. Chemical examination of the clover then revealed the presence of an ether-soluble substance with oestrogenic properties which was found to be concentrated in the leaves of the plant (Robinson, 1949). The presence in spring pasture of a like substance has been associated with the early season flush of milk in dairy cattle (Bartlett *et al.*, 1948). Still more recent investigations (Legg, Curnow & Simpson, 1950) in England have shown lucerne, white clover and timothy to possess little oestrogenic activity, whereas the oestrogen-like material is present in cocksfoot, perennial rye-grass and red clover. During the year of investigation, the activity of cocksfoot and perennial rye-grass had fallen markedly by the end of May, whereas the level present in red clover, a common constituent of short-term leys, was maintained at a fairly high value at least until the end of June. The last-named authors suggest that high oestrogenic activity is associated with the flowering phase of the plant, but whether, as in the management of leys, the oestrogen content might not be maintained in all cases if the herbage were kept at the young, rapidly growing stage is not evident. Although normal oestrogen may have antirachitic properties, there appears to be no *a priori* reason, bearing in mind the diversity of function of the steroid family, why the unknown substance might not combine oestrogenic and rachitogenic properties. This, of course, is almost pure hypothesis, but its significance may be seen in connection with the second of the recent developments to which reference has been made previously and which relates to the findings of Grant (1951), now to be described.

Green oats, both in England and in New Zealand, have been shown to possess rachitic properties for lambs. A chloroform extract of the dried material appears to possess anti-vitamin D activity ; the same is true also of Italian rye-grass, a common constituent of leys. By inference the rachitogenic substance doubtless occurs in some samples of dried grass at least and maybe in green hay also ; the increasing production and consumption of young dried grass in Britain is thus a factor worthy of consideration. Another interesting observation of Grant is that extracts of the dead, brown leaves are actually antirachitic : this recalls the work of Thomas and Moore (*op. cit.*) on the curing of hay.

Without attempting to oversimplify the problem, one may say that the discovery of an anti-vitamin D in plants would help to bring into line a number of curious anomalies recorded in the literature. Thus Akerblom (1949) has described " a seemingly mysterious phenomenon . . . where rachitic foals have been kept in sunny spring pastures and have become worse." Krupski and Almasy (1936) recorded the example of two rachitic calves, which improved after the administration of large doses of vitamin D but not on summer pasture ; here, of course, phosphorus deficiency may have been a contributory factor.

Hitherto the species most affected by the oestrogen-like material and the rachitogenic substance(s) have been sheep and cattle. It seems improbable that other species will be completely unaffected although species differences may exist between the magnitudes of the responses. The important fact is that both of these substances occur in green fodders and may thus influence the vitamin D status of the grazing animal or of the beast consuming conserved grass.

(*d*) *Avitaminosis D in Britain.*

At this stage evidence for the existence of avitaminosis D in Britain can now be reviewed : the possible criteria of avitaminosis have been considered in Part II. One would expect to find impaired utilisation of nutrients in animals of all ages, poor growth in young stock, rickets, though perhaps not of a severe type, and sensitivity to calcium-phosphorus imbalance. By their very nature the first two would be very difficult to identify by the clinician, save in extreme cases, for it would require much time and trouble to sift those examples of avitaminosis D from the general run of animals exhibiting poor condition from quite different causes. It is necessary to emphasise this point because the search is not for animals which are receiving no vitamin D at all but rather for those which are obtaining only a fraction of their needs. On the other hand, reports of the occurrence of clinical rickets would suggest the existence of sub-clinical avitaminosis D in much larger groups of animals failing to make satisfactory progress but not necessarily showing any marked bone disturbance.

Ewer (1950) has described retarded live-weight gain associated with the occurrence of rachitic-like conditions in lambs, while the observations of Blount (*op. cit.*) and others suggest, without providing rigid proof, that under conditions of intensive production in this country, pigs may derive insufficient vitamin D from sunlight plus the normal levels of cod-liver oil. While one is reluctant to accept anonymous statements as evidence, rickets in foals is said to be common in Britain (Anon., 1950) and Akerblom (*op. cit.*), though referring to a mean latitude rather north of the British Isles, regards the disease as worthy of practical consideration.

With regard to calves, much evidence may be expected to be lost in the absence of good records for that group of beasts which fail to thrive and are perhaps discarded as " poor-doers." Cases of frank rickets are unlikely to be common.

Apart from this one would look for signs of sensitivity to calcium-phosphorus imbalance both in young and in old animals. In this connection the observations of Hignett and Hignett (1951) are of much interest. These authors examined the breeding record of a number of dairy herds, the total number of animals, which were housed throughout the winter, being just over 800. Analyses of the rations provided on the day of service were accepted as being indicative of the calcium and phosphorus intakes of the animals during the period of observation.

On the basis of their observations the above workers found a direct correlation between the calcium intake and the conception rate of the animals, as well as a direct correlation between phosphorus intake and conception. They then proceeded to divide their animals into two groups according to whether these had received more or less than an arbitrarily chosen " standard " intake of phosphorus, the amount involving a maintenance allocation plus a quantity varying with milk output. It was then shown that animals receiving successively smaller allowances than the " standard " amount of phosphorus showed progressively lower fertility as the dietary Ca/P ratio increased ; on the contrary, increasingly higher fertility was found when the phosphorus given exceeded the " standard." On the basis of their results Hignett and Hignett suggested that the amounts of phosphorus at present believed to be necessary for maintenance and milk production in dairy cattle are too low and should be increased.

The results would seem to be better explained on the hypothesis that the animals were relatively vitamin D deficient. Firstly, the cattle were winter-housed and thus did not receive even the doubtful benefit of winter sunshine. Secondly, although specimen rations were submitted by the authors, they showed hay (rye-grass in the examples) to be

he only source of vitamin D : in a previous paper (Abrams, 1952b) doubt was thrown on the vitamin D potency of English hay. Thirdly, sensitivity to calcium-phosphorus imbalance is as well shown by these results as was ever demonstrated for a group of vitamin D deficient rachitic animals. Lastly, evidence already exists in which vitamin D deficiency is shown to affect adversely the reproductive cycle of the dairy cow (Wallis, 1938a).

Hignett and Hignett themselves state that fluctuations in the day-to-day calcium and phosphorus contents of the rations given on the same farm were marked and that there were considerable differences between farms. Were mineral imbalances to be corrected by the farmer himself he could only do it if also he were given the assistance of a chemist to carry out regular analyses. Failing that he would have to work blindly and try to guess whether he should add calcium or phosphorus compounds to his dairy rations. Guesswork would give him no more than a very moderate chance of correcting a calcium-phosphorus imbalance. On the other hand, the available evidence suggests that the administration of vitamin D would tend to correct the effects of too great an excess either of calcium or of phosphorus.

Of the two alternative ways of increasing the amount of absorption of a given nutrient, the first is to increase the amount ingested and assume that the efficiency of absorption remains the same as before : in many cases efficiency actually diminishes. The second alternative is to maintain the existing rate of ingestion and to try to improve the percentage of absorption. For the case of a highly productive animal, the alimentary tract of which has to absorb many nutrients simultaneously, it seems sounder to attempt the latter alternative. Now the current production allowances of phosphorus for the dairy cow allow a safety margin of about 100 per cent. Despite this, Hignett and Hignett propose that the intake should be " considerably higher." In view of existing knowledge of the inter-relationships between calcium, phosphorus and vitamin D it is irrational to advocate the adoption of a practice which would favour lower absorptive efficiencies and to fail to consider attempts to increase the degree of absorption and of utilisation of the element concerned. Moreover, quite apart from the problem of mineral absorption from the intestine, the experiments of Colovos and his co-workers (*op. cit.*), which were actually carried out on cattle, showed the beneficial influence of vitamin D upon metabolism generally.

It may be suggested that although the animals used in the investigations by Hignett and Hignett were housed for the six winter months without access to sunlight, and although hay may be a very doubtful source of vitamin D, there remains the possibility that the animals at pasture during the summer then derived stores of vitamin D sufficient to tide them over the experimental period.

For evidence relative to this point one must look to work done in America, since little or none is available from Britain. Calves in Michigan (lat. 45° N.), deprived of sunlight and vitamin D, became rachitic in one to three months (Duncan & Huffman, 1936). Gallup and Kuhlman (1942) noticed rickets to develop in calves at three to six months under similar conditions. In the mature cows used by Wallis (1938a) signs of depletion, such as a fall in serum phosphate levels, became apparent after two to four months on a vitamin D deficient regime. Tests with pigs, which had had access to autumn sunshine, showed that the black breeds were depleted of vitamin D in one to two months, whereas the white ones took approximately twice as long under identical conditions (Johnson & Palmer, 1939). Few though these examples may be, they do suggest that even when livestock are exposed to more powerful sunshine than is experienced in Britain and for longer periods (when the influence of cloud in Britain as compared with the mid-west of the U.S.A. is considered) their reserves are insufficient to tide them over the winter.

In support of their hypothesis Hignett and Hignett refer to the experiments of Meigs and his collaborators (1926). Since the English workers regard the results of the latter as being germane to their own problem, the American research in question must be examined.

Though the work done by Meigs was of first-class quality it was reported a quarter of a century ago,* within two years of the discovery that the irradiation of a foodstuff could lead to the acquisition of antirachitic properties but before vitamin D was isolated. It is no criticism of the Americans to say that they could not be expected to anticipate later discoveries in this field. Actually their experiments were finished in the spring of 1924.

For the trials three cows were used, in two combinations of two for the two experimental periods. While the animals were undergoing calcium and phosphorus balance trials, they were housed in metabolism stalls, the first experiment lasting about one month and the second six months. Of the three animals, one took part in both trials. Although it was eight years old, it had had only 82 days at pasture in its life. From September, 1920, until October, 1922, it was given neither pasture nor hay, although it did receive legume hay from November, 1922, until the first trial began in March, 1923.

While under test the cows, which initially were in milk, received both hay and concentrates. For the longer experiment two grades of lucerne hay and one of timothy were used in turn, the " good " hay being cut on the morning of a sunny June day, taken in during the afternoon and cured " without its being exposed to the sun " : it was " quite green." The " poor hay " was left in windrows for nine days, was rained on for two days and was brown. The amounts of hay consumed per day varied from about 7 to 18 lb.

In the trial of six months' duration, the first four weeks saw the use of the " good " hay only. Foodstuffs were changed without time being allowed for the animals to become accustomed to the change, the collection of urinary and faecal calcium and phosphorus continuing meanwhile.

Here, therefore, were two animals housed continuously for a long period, on foodstuffs of doubtful vitamin D potency. One cow at least had undergone what must be regarded as a long period of depletion. By the 18th week of the trial it was thought necessary to dose both cows with cod-liver oil, since the serum calcium and phosphorus levels of one animal at least were then below normal. Following upon three weeks of such treatment the levels rose to normal and there was an increase in the milk yield. Both animals drew upon their reserves of calcium and phosphorus from the beginning almost to the end of the experiment (after cod-liver oil had been administered).

The work of Meigs and his collaborators was done in Maryland, one of the few regions of the U.S.A. where the amount of solar activity is not unlike that of south Britain. It is interesting, therefore, that 7 to 18 lb. per day of hay, " good " or " bad," were inadequate to provide sufficient vitamin D to maintain serum calcium and phosphorus levels throughout the six months' trial. This has a bearing upon the experiments of Hignett and Hignett, for the phosphorus allowances given to the American cows were even more generous than those recently advocated by the English workers. Yet in both cases, even though one animal began by giving little more than 1 gallon of milk per day and was dry several weeks before the end of the experiment, the

* The present writer hopes subsequently to review and reassess much of the painstaking research on calcium and phosphorus metabolism carried out by workers of this period.

animals lost calcium and phosphorus almost throughout the whole period. The results contrast strongly with those of Wallis (1938a) with cows receiving an ample supply of vitamin D.

Many experiments concerning a variety of animal species have already been cited in support of the importance of vitamin D in mineral absorption, but this argument may well close with a quotation from recent work with sheep (Franklin & Reid, 1948). "A high dietary intake of calcium and phosphorus failed to maintain normal serum-calcium and serum-inorganic-phosphorus levels in sheep housed indoors at Sydney, N.S.W. . . . these abnormalities were quickly corrected by the administration of a vitamin D supplement and did not occur among weaners which were similarly fed but were exposed to abundant sunlight."

To return to general considerations regarding avitaminosis D in livestock, the last field remaining for survey is that of the estimated vitamin D requirements of different mammalian species, always bearing in mind the reservation that such needs are not independent of dietary intakes of calcium and phosphorus. For man normal daily allowances of about 800 I.U. per 100 lb. bodyweight have been suggested by the U.S. National Research Council, the amount being doubled during pregnancy or lactation. Requirements for early growth are also set at a very high level.

In the case of lambs, New Zealand observers (Fitch & Ewer, 1944) reported that 800 I.U. per day were insufficient to ward off rickets in animals receiving green oats. A massive dose of 1,000,000 I.U., which represents a probable average of 5,000 I.U. per day, proved entirely adequate. Andrews and Cunningham (1945), again in New Zealand, suggested that the minimum daily requirements for sheep are about 180 I.U. per 100 lb. liveweight, while the U.S. National Research Council (1949–50) in the absence of more exact information, specify 250 to 300 I.U. on the same basis.

For pigs, daily intakes of about 150 to 300 I.U. per 100 lb. bodyweight, depending upon condition, have been recommended (U.S. National Research Council, *op. cit.*).

Information as to the requirements of horses for vitamin D is very meagre. American suggestions are again for an intake of about 300 I.U. per 100 lb. liveweight per day.

Experiments, to some of which reference has already been made, tend to show that a calf may need 300 to 400 I.U. of vitamin D per 100 lb. liveweight daily, especially if it is not receiving a good supply of milk, while Wallis (1944a), who is probably the best authority in this field, has suggested that a dairy cow may need as much as a total of 5,000 to 6,000 I.U. daily.

In the case of the dog, daily intakes of about 400 to 500 I.U. of vitamin D per 100 lb. liveweight appear to be adequate where the calcium-phosphorus ratio is kept within narrow limits. Breed differences among this species already have received mention.

On the whole, therefore, bearing in mind the definite limitations of some of the evidence and restressing the importance of the calcium-phosphorus ratio of the diet, mammalian needs for vitamin D do seem to vary approximately with bodyweight and to be not less than about 300 I.U. per 100 lb. liveweight, with growing, pregnant and lactating animals needing probably still higher proportions.

It has already been calculated that sunshine in the latitudes of the British Isles is likely to provide no more, and probably less, than the following daily ranges of vitamin D for a 1,000-lb. beast :—

Latitude 50° N. 3,000 to 7,000 I.U.
Latitude 60° N. 2,000 to 4,000 I.U.

On this account the vitamin D status of many animals in Britain is considered to be questionable.

(7) Some Wider Aspects of Vitamin D in Relation to Animal Health

The subject matter of preceding sections has been presented as factually as the available evidence will permit. Where data have been lacking with regard to a given species of livestock, assumptions have been made only when there has been a sufficiency of relevant information from other species maintained under similar conditions. Surveys of existing fields of knowledge are sometimes rather fruitless, however, unless they suggest future lines of attack.

When one speaks of livestock in relation to their environment, the very word "environment" is in danger of being given too static a meaning, as though, unlike the animals themselves, environments show no development in time and have no evolution. Clearly, this is a false conception. As the zoologist studies the progressive changes of structure and form which have taken place as the animal world has evolved, nutritionists should look for corresponding evidence of change and of adaptation in the nutritional sphere. Part of such evidence must lie in the nutritional relationships which may be found between the growth of animals and their natural environments. Here the word "growth" is used in its widest sense, to include the phenomena of reproduction.

If one takes for such consideration the case of herbivorous animals native to the temperate zones, where there are clearly marked summer and winter seasons, the results of studies of the phenomena of growth by Hammond (1948) and Mitchell (1929 *et. seq.*) and their collaborators may be put beside existing knowledge of the characteristics of soils and plants indigenous to the same regions.

It is known, for example, that the chances of survival of young mammals depend firstly upon their vigour at birth, which in turn is a function of the feeding of the dam during the later phases of gestation. The progress of the newly born creature, however, also depends upon a good milk supply by the dam. Here the presence of oestrogen-like compounds in the spring herbage could be an important factor in encouraging milk flow, as other workers have suggested.

The work of Hammond (*op. cit.*) has also shown, however, that satisfactory growth implies the early development of bone, for which the assimilation of calcium and phosphorus is essential. The presence of rachitogenic substances in the spring herbage might actually be a means of making maternal calcium and phosphorus reserves available to the young animal, provided that such agents did not pass into the milk. There is plenty of evidence of mammary capacity for preventing the transfer of metabolites including nutrients : in the case of vitamin D itself the efficiency of transfer of dietary supplies to milk can be of quite a low order. A limiting factor of this kind would serve indirectly to make the progress of the young beast less dependent upon the calcium and phosphorus contents of plants and soil at that time of the year.

It would not be to the final advantage of the dam, however, that milk production should be prolonged or that her skeletal reserves of mineral elements should be depleted unduly. The disappearance of the rachitogenic agent from plants, as the season progressed, and its replacement by (or even conversion into) "vitamin D" could be an essential link in the chain of events.

It may be asked how the formation of bone in the young animal is to progress if rachitogenic agents are present in the spring herbage upon which the dam feeds. The answer lies, firstly, in the building up of reserves of vitamin D by the dam during the summer, secondly, in the possibility of the young animal being born with reserves of vitamin D adequate for its early growth and, thirdly, in the presence of calcium and phosphorus in good ratio in milk. On the second

point there is evidence with species as diverse in kind as the rat (Embleton & Collings, 1947) and the cow (Guerrant, Morck, Bechdel & Hilston, 1938), of the status of the dam before parturition having a marked influence upon bone development in the young animal in the period shortly after birth. Another point not to be lost sight of is that, since irradiation is a function of surface and not of weight, the young animal is a more efficient instrument for vitamin D synthesis than the older, mature beast. Sunlight too feeble to satisfy the needs of the dam might still be adequate for the young.

The cycle of events might be disturbed, perhaps very profoundly, in many ways, as, for example, by the selection of cows for long and heavy milk production, by the autumn birth of young animals instead of in the spring, by the introduction of plant species not native to the region concerned and by the management of pastures so as to disturb the normal rhythm of plant life.

Another, final example of possible evolutionary sequences may now be put forward. There is much evidence to suggest that short hair and dark skin together provide good conditions for the flourishing of livestock under exposure to intense heat and light. Relative insensitivity to the action of vitamin D, as an additional safeguard against over-irradiation, would constitute another useful acquired faculty, although the present writer knows of no direct evidence that black breeds of a given species, away from sunlight, are less sensitive* to vitamin D than unpigmented ones. It would be a suitable subject for experimental testing.

If, however, short coats, dark skins and diminished response to vitamin D were originally genetically linked, there would always be the possibility of their subsequent separation. It is provocative of thought to note that Wilson (1935) has recorded the liability to rickets, apparently inherited as a simple Mendelian recessive character, of rex rabbits. The exceptionally short dense fur of these animals, with the absence of guard hairs, seems to be the significant factor here, for the colour of the rabbits may vary from white (albino) to black. Rex rabbits originated as mutants about 25 years ago. The rabbit species is said to have been brought from Spain to Britain in quite recent times.

Whether the suggestions which have been made are correct or not is of very minor importance compared with that of viewing the production of vitamin D by sunlight in terms of skin structure as a whole and not merely in relation to pigmentation. It is here, of course, where animal breeding problems are directly concerned with vitamin D and with the environment of livestock.

CONCLUSIONS

Despite the necessarily incomplete nature of the evidence the following conclusions can be drawn from the subject matter of this paper and the two preceding ones.

Firstly, the available astrophysical, biophysical and meteorological data suggest that the vitamin D producing power of sunlight in the British Isles is not great and compares unfavourably in this respect with that experienced in central and southern Europe and in most of the U.S.A. In consequence the vitamin D potency of average British hay is believed to be low.

Secondly, after taking into account the different factors involved, calculations show that the vitamin D produced by the solar irradiation of the larger domesticated animals in Britain is either just about equal to, or more probably less than, the amounts which they need for normal health and productive function under average farm conditions.

In the clinical field there is evidence that rickets occurs in young animals, not only in the British Isles but even in countries which enjoy greater abundance of sunshine than our own. In this connection practical policies, such as the selection of animals for early growth and maturity, or the present autumn breeding of dairy cattle, may both be important secondary factors.

The contention of some workers that the present phosphorus allowances for dairy cattle should be increased cannot be accepted without further supporting evidence. Although the nature of the relationship of vitamin D to phosphorus is such that for certain specific purposes a response may be obtained in mammals by an increase in either vitamin D or phosphorus intake, the present phosphorus allowances, in providing a safety margin of about 100 per cent., should be ample. Quite apart from its general benefits to the whole organism, there is ample experimental evidence to show that increased vitamin D intake assists the absorption and utilisation of dietary calcium and phosphorus. Therefore, the postulation of calcium and phosphorus "standards," without specific reference to the vitamin D status of the animal, is meaningless.

From this last point of view, it seems anomalous that in the specifications for National Cattle and Horse Foods (The Feeding-stuffs [Manufacture] Order, 1952), limits for calcium are sharply defined, and those for phosphorus almost equally so (by virtue of the general requirements which these foods must satisfy), whereas there is no mention of vitamin D, without which neither of the two elements can be adequately absorbed or metabolised. The calcium and phosphorus turnover of the high-yielding dairy cow presents just as many problems as, if not more than, that of the young pig, to the manufactured winter ration of which the Order requires the addition of a vitamin D supplement.

The relevance of grass production cannot be overlooked, since recent work has suggested the presence in some common components of leys of an anti-vitamin D factor, as well as other potently physiologically active substances.

Much excellent work is now being done on the behaviour of breeds of livestock indigenous to the temperate regions, under the conditions of tropical environments, but it should be remembered that movement in the reverse direction also has occurred, since some British breeds of livestock are, or may be in part at least, of tropical or subtropical ancestry. In addition to conformation and other desirable qualities which have been the reason for the introduction of such stock, *e.g.*, pigs, into British breeds, other characteristics, related to their evolutionary development in very sunny environments, may have been inherited. Consequently a rather sunless habitat, especially under conditions of intensive production, many present added difficulties of functional adaptation to livestock having such ancestry.

More important, perhaps, than any conclusions which have been reached with regard to vitamin D is the position of livestock production in these islands. Methods of production probably never have been constant at any time, but in recent years the move towards more intensive production has been accelerated. One cannot set out, however, with the aim of producing meat more rapidly, or two litters per year instead of one, or increased milk yields from dairy cows, and yet continue to think only in terms of starch and protein equivalents, or any more fashionable group of nutrients : nor must grass and arable crops be thought of in the same limited

* For the purposes of this hypothesis the several means by which an organism might become less sensitive to vitamin D is of no immediate importance. It could include the diminished response of renal epithelium to dosage with vitamin D, with consequent increased liability to loss of inorganic phosphate in the urine. From this aspect it would be interesting to ask whether clinical records reveal, for example, any association of "renal rickets" in animals with coat length and colour, or skin pigmentation.

terms. Of what use is it to produce more protein in animal fodders if the protein is not to be utilised efficiently by livestock, simply through failure on the part of the manager to take into account those other dietary agencies which contribute to efficient food utilisation? In the natural evolution of livestock one may be sure that the environment, including food, also changed. When, therefore, the drive for greater food production for human use seems to necessitate new methods of feeding and management for livestock, it is surely time to think of animal nutrition from an evolutionary aspect and of the animal itself as a living creature responsive to many influences. Useful lessons must come from such studies.

The present and future positions of the individual clinician, with regard to problems of the kind which have been discussed, are perhaps not enviable from many points of view, for *pari passu*, the more successful systems of animal production become, the more subtle may be the manifestations of disease. Kay and Barret (*op. cit.*), among other workers, have shown that three times as much vitamin D is needed for the deposition of satisfactory amounts of mineral matter in bone as is required for the clinical alleviation of rickets, as judged by X-ray examination. Instead of frank rickets, however, the veterinary practitioner may be faced with nothing more than rather diminished growth rates. Measurement of the efficiency of performance of some particular physiological function may need to become one of the "yardsticks" of animal health. Though one may not agree with their suggested cure, there is no doubt that the use by Hignett and Hignett (*op. cit.*) of fertility rates in livestock as a measure of animal productivity is very valuable. The importance of such studies to a nation faced with an increasing demand for home-produced food cannot be over-estimated, but as the above authors themselves have emphasised, the data from many regions may have to be correlated by some central body. It seems like the introduction of group medicine into the veterinary field.

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REPORT

[New South Wales Department of Agriculture : Livestock Health Report, No. 25, June 30th, 1949.]

The report is divided into two sections, disease control and research. Figures on the incidence of tuberculosis, brucellosis and anthrax in the different regions of New South Wales are given and these include an interesting picture showing the decrease in the percentage of reactors to the tuberculin test in one district over a 12-year period. The incidence of mastitis in cattle is discussed, together with ophthalmia, enteric infections of calves, bovine trichomoniasis, Johne's disease, swine dysentery, pullorum disease, spirochaetosis of fowls, contagious pustular dermatitis, external parasites of sheep and cattle tick. Trichomoniasis in cattle is recorded for the first time and observations on this condition have been commenced.

In the research field, work at the Glenfield Veterinary Research Station includes the use of penicillin in bovine mastitis control, a survey of the incidence of swine erysipelas, the use of liver meal in the control of perosis in turkeys, observations on " bent leg " in lambs, and the epidemiology of ataxia in sheep possibly associated with the ingestion of the plant *Tribulus terrestris*. Omphalitis infection in chicks and spirochaetosis of fowls are also receiving attention. An artificial insemination service is provided from the Station.

Drought feeding observations with sheep fed at daily and weekly intervals, toxaemic jaundice study and a " deferred grazing " trial are being conducted in association with other organisations. Work on poultry feeding and genetics is in progress on the Seven Hills Poultry Experiment Farm. Sheep nutrition trials at the Shannon Vale Experiment Station have demonstrated the economic advantage of a late rather than an early spring lambing in that area. I. L. J.

THE VETERINARY RECORD

March 29, 1952

SHEEP PRACTICE

WITH a sheep population in Britain of approximately 20,000,000 it is easy to understand the important part the industry plays in the economy of the country. The veterinary profession has a great opportunity to prove its worth. Never before has it been more essential that our knowledge be put to practical use in order to reduce the heavy preventable loss among sheep and so help fill the nation's larder, replenish wool stocks and stimulate the export trade.

There is no doubt that much good would arise if more co-operation existed between sheep farmers and veterinary surgeons. Such would have a twofold effect. First, there would be an immediate saving of food by reducing much of the loss from disease ; secondly, there would follow a gradual increase in the carrying capacity of many farms.

A formidable barrier to progress has been the belief long held by many sheep farmers and shepherds that a sick sheep meant a dead sheep. Losses were just accepted as inevitable. This conception could be broken down completely in a few years. Many factors might contribute to its demolition, among them being the advance in our knowledge of sheep diseases and the proved efficacy of the resulting methods for specific prevention or treatment.

The achievements of veterinary research workers in this field of research during the past 20 to 30 years are recognised and have been duly appreciated by the veterinary profession and by many progressive sheep farmers. Our workers have elucidated the cause of many major affections of sheep and have developed proved methods for their control.

Although sheep practice has increased greatly during the past few years it is still much less than it should be. The question, therefore, is, how can the veterinary profession stimulate the interest of the farmers and shepherds and foster amongst them recognition that we can render them valuable assistance in the prevention and cure of disease ? The field experiments carried out by research workers have been most beneficial in this respect. Previously the shepherds were highly sceptical that any good could be derived from the use of a syringe but when the truth was revealed by the reduction in sheep losses they soon spread the news at clippings, markets, etc. The Veterinary Investigation Service is also doing very useful work by lectures and demonstrations. Further questions are : could a change in policy relating to the sales of vaccines and drugs for use in sheep diseases bring the veterinary surgeon greater opportunity to advise the farmers in their proper use and at the same time provide the necessary contact for the discussion of other sheep problems ? Is it possible for the Agricultural Research Council to do more to cut down the time lag between the proved findings of the research workers and the passing on of that information to the farmers ?

Sheep practice differs a good deal from other types. Preventive medicine plays a bigger part here than in any other class of practice, and, because of the inaccessible territorial location of a large part of the sheep population, it is perhaps fortunate that such is the case. Among the common ovine bacterial and virus diseases, passive and active immunity can be conferred by the use of specific sera and vaccines in such diseases as braxy, pulpy kidney, entero-toxaemia, lamb dysentery, black disease, louping ill and contagious pustular dermatitis. Ecto-parasitic infestations such as those caused by the ked, tick, and louse, sheep scab, blowfly strike, etc.,

yield, as we well know, to control by dipping—the results having been greatly improved since the incorporation of DDT and BHC preparations into the dips. The control and treatment of helminthiasis also have improved in recent years through a better understanding of the life histories of the parasites and the proper use of the more efficient drugs such as phenothiazine. In functional disorders such as "cobalt pine," preventive and curative methods have been devised and good results can be obtained by top dressing of pastures, by feeding suitable mineral supplements or by direct dosing. In this last group can be included swayback, pregnancy toxaemia, etc., where the use of appropriate mineral supplements and attention to diet can prevent or at least reduce losses. Any of these measures of disease control are practicable, to a greater or lesser degree, under all forms of husbandry.

In recent years treatment of individual cases of illness in sheep has become quite an important part of the veterinary surgeon's work. The introduction of the sulphonamides and antibiotics has enhanced greatly our prospects of success in combating many of the bacterial infections. This has been found to be the case in the treatment of metritis, mastitis, pneumonia (especially of transit origin or in the housing of tups), gastro-enteritis, etc. Success in treatment depends very largely on the ability of the shepherd to detect illness in its early stage. Normally, treatment is economical only in lowland flocks and especially in pedigree flocks where tups are reared ; it is, furthermore, in this type of husbandry that these conditions are most commonly encountered.

The risks under a general anaesthetic do not rise above the normal for the domesticated animals subjected to anaesthesia. Although the need for carrying out major operations upon sheep does not arise very often, it is possible that the caesarean operation ought to be resorted to more often in difficult parturition.

Correct diagnosis is, in sheep, no less than in the other animals, the foundation stone of practice and a careful clinical examination of the patient(s), coupled with a complete history, often leads one to an accurate diagnosis. Sometimes it is necessary to seek laboratory aid ; many negative results are reported from this source because of the delay in transit of diagnostic material. The Veterinary Investigation Service has helped considerably here in aiding diagnosis, but more laboratories must be set up before the facilities can be deemed sufficient.

If the veterinary surgeon is to assume his full responsibilities in the control of sheep diseases, it is essential that he be fully conversant with sheep husbandry in all its aspects. A healthy sheep stock can be maintained only under a good system of management. Good management not only helps to control the major ailments but goes a long way towards preventing the various degrees of unthriftiness about which there is so much complacency but which, nevertheless, result in a very appreciable economic loss to the farmer and to the country.

There still remain many recognised sheep diseases concerning which our knowledge is very incomplete, but there is every reason to believe that the stimulus of past success will encourage our research workers and their colleagues in the field to even greater achievement.

Weekly Wisdom

"I cannot help feeling that before long the cost of the heavy horse will defeat the object we have in view—to produce at a price within the ambit of the man who wants a draught horse for work on the farm."—Mr. J. C. Drennan, Carse Hall, Limavady, in moving the adoption of the report at the annual meeting of the Clydesdale Horse Society.

CLINICAL COMMUNICATION

BACT. COLI INFECTION AS A CAUSE OF AGALACTIA IN THE SOW

B. N. JACKSON, M.R.C.V.S.,
Uckfield, Sussex

Introduction

After having read Mr. Alexander H. Hogg's article on agalactia in the sow in *The Veterinary Record* of January 19th, I feel it may be of interest to record my own experiences and conclusions concerning this condition, which gradually is becoming more widespread in this district.

During the last 12 months it has been increasingly noticeable that a greater number of cases of sows and gilts, which have recently farrowed, are suffering from an immediate lack of milk or that the supply is failing rapidly. This condition was first encountered only in pigs of the Large White breed, but more recently it has been found to occur in the Wessex.

A very common history is a normal farrowing with one or two dead piglets or the death of some of the litter within two or three days without any apparent reason. At other times litters from affected sows have been found to be liable to a severe attack of scouring in which the mortality is high.

General Symptoms

During pregnancy the sow has been in perfect health.

The time of the appearance of symptoms seems to vary from a few hours after the end of farrowing up to about three weeks. The commonest complaint is that there is inappetence and the sow just lies around and will not allow the piglets to suckle. It is usual for affected sows to lie flat on their udders and no amount of persuasion will get them to lie over on their side.

Little or no milk can be drawn from any of the teats and the sows resent much handling of the udder. The udder itself is very hard, usually the fore and hind teats being the most swollen. Pyrexia is usually present to a slight degree, but the highest temperature yet recorded by me is 104·5°. Very often it has been found to be subnormal, *viz.*, 100·5°.

In some cases there is present a copious creamy white discharge from the vagina, which has the appearance of chronic whites in the cow, but many cases have been found where the discharge is absent and the only symptoms present are inappetence and agalactia with a slight degree of pyrexia.

Symptoms as seen in Piglets.—Very often they are born dead or die shortly after birth with no visible symptoms, and deaths have also been encountered in litters of up to three weeks of age. Shortly after these first deaths the remainder of the litter start scouring profusely with a vivid yellow diarrhoea. They become very weak, unable to suckle and lie about ; they quickly die if no treatment is forthcoming.

Bacteriological Examinations

Many samples of the vaginal discharge were taken from these cases by means of a sterile pipette and sent for laboratory examination, the report in each case being that the organism present was *Bact. coli*. Examination of bowel contents and smears taken from these piglets revealed the presence of overwhelming numbers of *Bact. coli* organisms. Blood smears taken from the hearts of these piglets also showed the presence of these organisms in large numbers.

Udall reports a similar condition in piglets where *Bact. coli* could be cultured consistently from the mesenteric glands, kidney, spleen and heart blood.

Post-mortem examination of the piglets shows the intestinal

contents to be of a very fluid nature, bright yellow in colour, and having a foetid odour. There is enteritis of the small intestines. In cases which have lived three or four days after the onset of symptoms, a pneumonia may also be seen.

Treatment

Before any samples had been taken a few cases were treated by means of penicillin and sulphonamides but the response was negative or very slight indeed. The bacteriological findings prompted the use of a *Bact. coli* serum in the treatment of the condition, that used being Bayer's "Aggrecolin."

It was observed that after a single injection of 70 to 120 c.c. of Aggrecolin, according to the size of the sow and the severity of the attack, there was a marked improvement in the sow's condition. The animal came on to her food and her milk came in, with the udder gradually beginning to lose its hardness.

The treatment of the piglets consisted of doses of serum of from 5 to 12 c.c., according to size, and repeated again in two days' time.

Case Reports

Case A. *Subject.*—An aged, Large White sow.

History.—Served by a Wessex boar which was kept on the farm. Farrowed 3.7.51 with nine piglets. When seen two days later two piglets had died, having been crushed by the sow.

Symptoms.—The sow's udder was very hard and swollen and only a very little milk could be drawn from any of the teats. Her temperature was 103°. There was inappetence and a slight white vaginal discharge.

Treatment.—75 c.c. of Aggrecolin serum was given to the sow. When seen on 6.7.51 she had started to feed, the udder was softer and milk could be drawn from all teats. Temperature 102°. There was no visible discharge. A further 60 c.c. of serum was given. When seen on 7.7.51 she was clearing up all food and the udder felt normal and there was plenty of milk.

This sow has now farrowed again; she had only one piglet and has had no trouble.

Case B. *Subject.*—A Wessex gilt with her second litter.

History.—She had had no trouble with her previous litter, when she farrowed six piglets and reared them all. This animal had been served by the same boar as Sow A. She farrowed on 16.7.51 during the night with nine piglets, two of which had died and were destroyed by the owner. Up to the time of the first visit the owner had been feeding the pig'ets on the bottle.

Symptoms.—18.7.51. Inappetence; temperature 103·5°. A copious creamy vaginal discharge was present. Her udder was very hard and swo!len and no milk could be drawn from her. It was noticed with this gilt in particular that she lay down flat on her abdomen.

Treatment—60 c.c. of Aggrecolin serum was given to the sow and the piglets were given 5 c.c. each as a prophylactic measure.

19.7.51. The udder was softer and a little milk could be drawn from a'l teats. She had eaten a little. Temperature 102·5°. There was still a lot of discharge. 100 c.c. Aggrecolin given.

20.7.51. Temperature 102·5°. Slight discharge only, eating fairly well, udder much softer and milk could be drawn freely from all teats. She would al'ow the piglets to suckle her now without any troub'e. Bottle feeding of the piglets was now discontinued.

21.7.51. The gilt was clearing up all her food, her udder was normal and there was no discharge.

When seen on a subsequent visit a fortnight later the gilt was milking well and the litter was well and contented.

This gilt has now farrowed again with 13 piglets without any further troub'e after being served by a different boar.

Case C. *Subject.*—A small Large White gilt.

History.—Served by a young Large White boar to which she returned once. The boar also served this gilt's two litter sisters, which farrowed normally with 10 and 11 piglets. This gilt farrowed on 8.3.51, when she had fed a little.

Symptoms.—9.3.51. Complete inappetence; udder very hard and no milk could be drawn. A freely flowing white discharge was present. She was very reluctant to move. Temperature 101·5°.

Treatment.—Aggrecolin, 120 c.c.

10.3.51. Feeding well; temperature 102°. There was no discharge. The udder was much softer and milk could easily be drawn from all teats.

13.3.51. Still feeding and milking well.

I have several records of cases of a similar nature, with their treatments, all of which have responded in the same manner. It was rare in the case of litters to find that more than two injections were necessary to counteract the scouring.

It is interesting to note that Sow A and Gilt B, which came from different farms, were served by the same boar within a few days of each other and they both developed agalactia with a vaginal discharge after farrowing. There are other records of sows served by the boar which have also gone down with agalactia.

Summary

1. A condition of agalactia in the sow is recorded, the causal agent being *Bact. coli.*

2. A virulent type of scours in young piglets, due to the same organism, also has been recorded.

3. The chief symptoms are inappetence, agalactia, hardened udder, a slight degree of pyrexia and a creamy white vaginal discharge.

4. There is some evidence of venereal origin.

5. Treatment with Bayer's "Aggrecolin" *Bact. coli* serum has been effective in all cases in restoring and maintaining the milk supply.

I would be very interested to know if anyone else has had the same experience in treating agalactia.

Reference

Udall. "The Practice of Veterinary Medicine."

ABSTRACTS

Fertility and Bacterial Content of Diluted Bull Semen Treated with Streptomycin*

Four Holstein-Friesian and four Guernsey bulls were used, and semen was collected four times from each bull at exactly 14-day intervals. Following collection, the semen was diluted at the approximate rate of 1 : 75 in a diluent composed of one part egg yolk and four parts 2·9 per cent. sodium citrate containing 0·6 per cent. sulphanilamide. Each sample of semen was then divided into four equal portions and dihydrostreptomycin sulphate solutions added so that the concentrations tested were of 100, 300, 900 μg. per ml., and a no-treatment control.

Twelve inseminators were divided into four groups, and each group received semen at each treatment level from each bull. First services only were considered, and the 60- to 90-day non-returns percentages for all bulls were 61·4, 69·2, 76·5 and 72·0 for the treatment levels of 0, 100, 300 and 900 μg. of streptomycin per ml. respectively. For the four Holstein-Friesians the percentages were 62·4, 70·4, 78·1 and 70·7 and for the four Guernseys 60·4, 67·8, 74·9 and 73·2. It is suggested that a concentration between 100 and 900 μg. per ml. would be the optimum, and when a curve is graphically fitted to the response data it indicates that the optimum response occurs above 300 μg. per ml. Coupling with this

* **Fertility and Bacterial Content of Diluted Bull Semen Treated with Various Concentrations of Dihydrostreptomycin Sulphate.** Easterbrooks *et al.* (1951.) *Amer. J. vet. Res.* **12.** 191.

the fact that Plastridge and Easterbrooks have found a concentration of 500 μg. of streptomycin per ml. necessary to inhibit *Vibrio foetus* organisms in diluted bull semen held at 5° C., it seems that the 500 μg. per ml. level is the most practical for recommendation at this time.

Each day 0·2 ml. of raw semen and 2·0 ml. of each of the four treatment portions from each bull were plated on beef infusion-blood agar plates, and bacterial counts were made. In general the bacterial count was inversely proportional to the concentration of streptomycin, but the fertility was not solely dependent upon the number of micro-organisms present. Diphtheroids and micrococci were isolated with the greatest frequency. Haemolytic streptococci, haemolytic bacilli, members of the genus alcaligenes, *Gaffkya tetragena*, *Pseudomonas aeruginosa* and various moulds and fungi were also isolated. *Escherichia coli* was not isolated. Proportionately, more moulds and fungi were isolated at the higher than at the lower or no streptomycin levels. No correlation was observed between the fertility of diluted bull semen and the presence of specific types of bacteria.

J. O. L. K.

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Infectious Pneumonia of Pigs: Transmission and Differentiation from Swine Influenza*

A common form of pneumonia of pigs distinct from swine influenza exists in the United Kingdom. This disease is caused by a filtrable agent, and the condition has been confused with swine influenza, which is not common in this country or Australia. The authors agree with Pullar that a rise of 1·8° F. in the rectal temperature of inoculated pigs is of pathological significance. As a rule, rectal temperature is very high in the pig after swine influenza inoculation, but there may be little or no rise in infectious pneumonia. The disease was sometimes produced by intranasal inoculation of filtrate, and at other times by suspensions of bacteria-free lung tissue. The lung lesions thus produced were generally free of bacteria. There was a significant rise in rectal temperature reading after the second, third, fourth and fifth day of inoculation, and this rise held for at least four days. In other cases there was no temperature rise until from the 8th to 11th day, and this was seldom very marked. Several pigs had little or no significant rise in temperature although found to be affected with pneumonia at a subsequent autopsy. In its distribution in the lung, the pneumonia found was usually of the marginal type and not raised above the normal level of the pleura.

There is little evidence that the infection could be established in ferrets, neither was there evidence of any multiplication of the infective agent in chick embryos, nor in mice after intranasal inoculation. Serological and other tests for swine influenza on pigs which developed the disease and on ferrets were negative. Six strains of the agent were isolated. The name " infectious pneumonia of pigs " is given to the disease, and it is differentiated from swine influenza as the infectious pneumonia develops more slowly. Clinically, pigs often appear normal, although affected with pneumonia and having a temperature.

The type of pneumonia seen in the two diseases is similar macroscopically at autopsy. In influenza lesions may be present as early as three days after inoculation, but in pneumonia cases lung lesions may not be present in seven days. Use of the methods by which virus can be detected has failed to enable the authors to isolate the virus of infectious pneumonia. The causal agent persists for more than two weeks after inoculation, whereas 10 days after it has not been possible to recover Cl strain of influenza virus. There is some evidence that the infective agent may be present not only in the lungs but in the circulation, and it is believed possible to transmit it by intravenous inoculation.

D. J. A.

* **Studies on Respiratory Diseases of Pigs. IV. Transmission of Infectious Pneumonia and its differentiation from Swine Influenza.** Gulrajani, T. S., & Beveridge, W. I. B. (1951.) *J. comp. Path.* **61. 118-139.**

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Human Tuberculosis of Bovine Origin in Northern Ireland*

In a survey made from unselected material sent into the Central Laboratory of the Northern Ireland Tuberculosis Authority from 1945 to 1950, the author has compiled the following table to indicate the percentage of bovine type human infection :—

	Human	*Bovine*	*Percentage bovine*
Pulmonary	1,060	1	0·1
Meningeal (including miliary)	237	8	3·37
Cervical glands	30	4	13·3
Bone and joint	86	3	3·5
Primary abdominal	2	0	—
Genito-urinary	16	1	6·2

The extremely low incidence of bovine type pulmonary tuberculosis confirms the observations of Cumming (1935) in Eire, and of Kearney, Farrelly and Cronin (1949). Detailed examination of the figures for meningitis showed the usual tendency for the disease to develop in early youth or late adolescence.

Whereas this table, compiled in 1950, shows only 3·37 per cent. of tuberculous meningitis and 13·3 per cent. of tuberculous glands to be of bovine origin, McMurray (1941) gave a figure of 28 per cent. meningitis and 16·5 per cent. adenitis, while Mushatt (1940) in Eire indicated 25 per cent. meningitis and 71·4 per cent. cervical adenitis (14 cases only).

The incidence of tuberculosis in cattle in Northern Ireland cannot be said to have fallen appreciably during the same decade. The Attested Herd Scheme was initiated only in 1949 and to-day approximately 7·5 per cent. of churn samples still contain tubercle bacilli. Kerr, Lamont and McGirr (1949) reported an incidence of 33 per cent. tuberculous infection in a series of 600 bovine autopsies from 1945 to 1948.

But whereas in 1939 only 7 per cent. of the output of 15 million gallons of milk was pasteurised, in 1949 practically 90 per cent. of the 41·4 million gallons then produced was " safe," *i.e.*, heat treated or Grade A. The author concludes, therefore, that the marked fall in human tuberculosis of bovine type is due to the pasteurisation of milk.

J. P.

* **Human Tuberculosis of Bovine Origin in Northern Ireland.** Reilly, L. V. (1950.) *J. Hyg.* **48. 464-468.**

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Contagious Diseases of Animals*

This address to an R.S.I. sessional meeting consists mainly of a standard description of anthrax, swine fever, parasitic mange, sheep scab and tuberculosis. The author lays particular stress on the official regulations associated with these conditions and raises a number of interesting points regarding their dissemination.

N. S. B.

* **Contagious Diseases of Animals.** Dunn, P. Dennis (1952.) *J. roy. San. Inst.* **74-76.**

IN PARLIAMENT

Foot-and-Mouth Disease

In the House of Commons on March 19th, in the course of debate on the supplementary vote for the Ministry of Agriculture and Fisheries, Mr. Anthony Fell referred to the serious outbreaks of foot-and-mouth disease in East Anglia, saying that he saw from the explanation accompanying the vote that no less than £600,000 was needed for compensation to owners of animals slaughtered for foot-and-mouth disease. He wondered whether anything more could be done to cope with this dread disease, which killed so many of our animals and which affected some of the finest pedigree herds. They were told that it was thought that the disease came from the Continent, where it was said to be endemic, and might be carried to this country by starlings. Having regard to this huge expenditure of money, ought we not to consider trying to prevent the disease from spreading to our shores instead of slaughtering cattle and spending all this money in compensation? Had the matter been tackled on an international scale? Would it be possible to get together with the countries in Europe which were closest to us, and from which the disease spread to Britain, and create an international fund for the express purpose of tackling the disease at its source, namely, on the Continent?

If the disease could be cured in Europe, even though it took many years, it would be well worth our while taking very energetic action to cope with it, for it was hitting not only Europe but also this country very hard from the points of view of loss of food, loss to farmers and loss of exports of valuable cattle and livestock.

Mr. Archer Baldwin: He was not greatly surprised at the total of the original Estimate nor the additional sum required because it would be impossible, when framing the Estimates, to realise the extent of the outbreak of foot-and-mouth disease which we experienced recently. He agreed with the policy of slaughter. There were some critics who said that the life of the animal should be saved and that it would be better to cure rather than to kill. He did not agree with that, because it would mean that, like the Continent, we should have the disease with us permanently, and it would close down our important export trade.

He agreed with the sums that had been spent on slaughtering, and he thought the suggestion of his hon. Friend about endeavouring to contact the Continent to see whether some steps could not be taken to wipe out this foul disease was something which should be followed up. It would not only be in our interests, but in the interests of the Continent. Their losses during the course of 12 months must be extraordinary.

This disease must spread to us from the Continent, because the outbreaks always seemed to be on the eastern side of Great Britain. Occasionally we had an outbreak in the west, but it had never penetrated far enough west to reach Ireland, with one exception, and Scotland had been entirely free from the disease, except for the recent outbreak.

Mr. J. B. Godber agreed with the Member for Yarmouth (Mr. Fell) about the large figure for foot-and-mouth disease. Again, however, he would not dream of suggesting that we should stop our policy of slaughter. It was essential to keep it on. It was one good service which the Ministry had rendered, and it would be a policy of defeatism to go back on it. Although the figure was high, he did not think it was large by reason of what it had achieved.

The Joint Parliamentary Secretary to the Ministry of Agriculture (Mr. G. R. H. Nugent) in his reply to the debate said he would deal first with the two points raised by his hon. Friend the Member for Yarmouth (Mr. Fell) with regard to additional expenditure on the eradication of diseases of animals. He asked first whether more could be done in the way of research into the problem of foot-and-mouth disease. "The answer is that we have an admirable research station at Pirbright which has been working for many years and is at present being enlarged considerably. It has done valuable work in the past and I do not doubt that it will continue to do valuable work in the future.

"Secondly my hon. Friend expressed the belief that foot-and-mouth disease comes primarily from the Continent. I agree that the recent outbreak probably came from the Continent and was probably carried on the feet of starlings in process of migration. It would be a mistake, however, to think that it comes only from the Continent. In the past it has undoubtedly come from South America, in beef from the Argentine, and from other parts of the world, and there is always a danger in any imported meat.

"I agree with my hon. Friend that there is a special danger in the infection coming from the Continent, where the disease is certainly endemic I can assure him that our Chief Veterinary Officer, Sir Thomas Dalling, has been in the closest co-operation with the leading veterinary officers in the European countries through the machinery of the Food and Agriculture Organisation. He has had a number of meetings with them, has investigated a number of outbreaks on the spot and, apart from our own interests, has undoubtedly made a substantial contribution to the various European countries concerned in helping to get the disease under control. I can give my hon. Friend the assurance he seeks, that we are doing not only our share in this matter to protect ourselves, but also are helping other European countries to protect themselves.

"I do not have to answer any questions about the soundness of the slaughter policy. I was glad to hear all my hon. Friends agree that it is undoubtedly the soundest policy for us to follow. It is right and proper for me to call attention to the average cost that the slaughter policy involves to the public purse in an ordinary year, because the recent outbreak has been the worst, not in living memory, but certainly in the last 15 years. We have had nothing comparable since 1937.

"For instance, in 1948 there were only 15 outbreaks. There was the same number in 1949, and in 1950 only 20. The cost between April and September, 1951, was some £60,000. The average cost of pursuing the slaughter policy has run us into an expenditure, probably, of only about £50,000 to £100,000 a year. There is no doubt whatever that it has paid the country handsomely. We are lucky that we are an island and that the disease stays outside"

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Questions

Experiments on Animals (Inspections)

Mr. Eric Johnson (March 20th) asked the Secretary of State for the Home Department if he is aware that the number of inspectors employed by his Department is inadequate to provide proper supervision over experiments carried out on living animals, and thus ensure that no suffering is caused to such animals; and if he will increase the number of inspectors.

Sir D. Maxwell Fyfe: The present establishment of inspectors under the Cruelty to Animals Act, 1876, is, in my view, adequate for the proper supervision of experiments to which the Act applies.

Mr. Johnson: May I ask my right hon. and learned Friend if he really suggests that visits to 1,232 out of 1,779,215 experiments carried out on live animals provides an adequate safeguard? Would he not further agree that his inspection would be better done by veterinary surgeons rather than by doctors?*

Sir D. Maxwell Fyfe: Dealing with the first part of the supplementary question, I think the important thing is that the inspector can visit a laboratory at any time without warning and demand to inspect the animals and to see notes of the experiments. I should like notice of the second part of the supplementary question.

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School Milk (Quality)

Mr. Hollis (March 19th) asked the Minister of Education what guidance is given to schools or to local education authorities whether a preference should be given for the provision of tuberculin-tested or of pasteurised milk for their children.

Miss Horsbrugh: The local medical officer of health is responsible for approving the source and quality of the milk supplied for drinking in schools. It is the policy of my right hon. and gallant Friend the Minister of Food and myself to try to ensure that milk supplied to the schools is either pasteurised or tuberculin tested.

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Ministries of Agriculture and Food

Lieut.-Colonel Marcus Lipton (March 19th) asked the Prime Minister what steps he is taking to amalgamate the Ministry of Agriculture and the Ministry of Food.

The Prime Minister: None, Sir. As the hon. and gallant Member knows, the Lord President of the Council maintains the general concert of food and agriculture policy and ensures their full co-ordination.

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Cruelty to Wild Animals (Report)

Lieut.-Colonel Sir Thomas Moore (March 20th) asked the Secretary of State for the Home Department what steps he has taken, or proposes to take, to implement the recommendations of the Royal Commission on Cruelty to Wild Animals.

Sir D. Maxwell Fyfe: The recommendations of the Committee about deer poaching are substantially implemented in the Poaching of Deer (Scotland) Bill, which has recently received a Second Reading in another place. The other recommendations are still under consideration.

Sir T. Moore: Will my right hon. and learned Friend bear in mind that there is a large number of people, both for and against

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* See *Vet. Rec.* **64**, 157. In that issue (March 15th) there appears an editorial in which strong support is lent to the Hon. Member's contention.—*Editor.*

the Report, who are exceedingly anxious that one or other of its recommendations, apart from the deer protection, should be brought into effect? Will he, therefore, expedite consideration of the matter?

Sir D. Maxwell Fyfe: I will certainly continue and expand the consideration.

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Reserved Occupations

Mr. John E. Crowder (March 18th) asked the Minister of Labour if he will now issue an up-to-date schedule of occupations which would be reserved in the event of a national emergency.

Sir W. Monckton: I do not think it would serve any useful purpose to publish a schedule of reserved occupations now, when we do not know when, if ever, it is likely to be required, or what the circumstances of the time might be. Preparatory work on a tentative schedule is in hand, but it cannot at this stage be put into its final form to fit unknown conditions at some unknown date in the future.

Mr. Crowder: Can my right hon. and learned Friend say whether he will be calling up for National Service people whom he is quite certain would not be called up in the event of any national emergency?

Sir W. Monckton: I find it very difficult to tell my hon. Friend who would or would not be called up until I know the exact nature of the emergency. I cannot, therefore, answer that.

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Dog Licences (Revenue)

Mr. Crouch (March 20th) asked the Financial Secretary to the Treasury how many dog licences were issued in the years 1949, 1950, 1951; and what revenue they brought in each year.

Mr. Boyd-Carpenter: The number of dog licences issued for the year ended March 31st, 1949, and the two following years were 3,050,062, 3,089,450 and 2,921,534, with receipts of £1,143,727, £1,158,464 and £1,095,539 respectively. As the receipts in England and Wales go to the local authorities, only the sums arising in Scotland accrued to the Exchequer. They were £71,745, £74,525 and £69,678.

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Livestock Collecting Centres

Mr. Speir (March 17th) asked the Minister of Food what complaints he has received regarding the operation of grading centres for livestock; and whether he has any statement to make.

Major Lloyd George: I have not received any general complaint about the operation of livestock collecting centres, although local complaints on, for example, the grading of a particular animal are received from time to time. I should be grateful if my hon. Friend would let me have details of the matters he has in mind.

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Livestock Statistics (Scotland)

Mr. Woodburn (March 17th) asked the Secretary of State for Scotland the numbers of agricultural animals in Scotland pre-war and for each year from 1945 to the last full year and his estimate of the population for the present year in respect of dairy cattle, beef cattle, sheep, pigs and poultry, respectively.

Mr. J. Stuart: The following table shows cattle, sheep, pig and poultry numbers on holdings in Scotland over 1 acre in extent, as returned in June in each of the years 1933, 1939 and 1945 to 1951:

Year	Cattle: Dairy	Cattle: Beef	Sheep	Pigs	Poultry
1933 ...	711,610	582,027	7,811,144	167,028	8,514,047
1939 ...	740,742	607,901	8,007,134	252,264	7,710,999
1945 ...	823,292	636,500	6,899,009	170,564	7,313,087
1946 ...	823,591	648,422	6,953,914	169,492	7,708,683
1947 ...	814,481	644,123	6,024,688	148,288	7,916,803
1948 ...	827,662	671,581	6,730,664	183,700	9,284,741
1949 ...	842,799	725,771	7,102,873	232,445	10,006,270
1950 ...	852,653	763,737	7,337,269	250,830	10,073,107
1951 ...	823,247	776,880	6,858,883	339,053	9,920,969

It is difficult to estimate what the returns for the current year will disclose but, provided no unforeseen circumstances arise, the numbers may be about 805,000 dairy cattle, 775,000 beef cattle, 7,000,000 sheep, 435,000 pigs and 9,500,000 poultry.

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Axminster Shire Horse Society have passed a resolution urging Devon Education Committee to provide tuition in the handling and care of farm horses. Mr. G. E. Bird said it was increasingly difficult to find suitable people to work good horses.

NOTES AND NEWS

Diary of Events

April 2nd.—Meeting of the Editorial Executive Sub-committee, at 36, Gordon Square, London, W.C.1, 2.30 p.m. (*N.B.—One week earlier in the month than usual.*)

April 2nd, 3rd and 4th.—Meetings of Committees and Council, R.C.V.S., at 10, Red Lion Square, London, W.C.1.

April 3rd.—Meeting of the Central Division, B.V.A. in the Royal Veterinary College, N.W.1, 10 a.m.

April 3rd.—Meeting of the Lincolnshire and District Division, B.V.A., at Lincoln (Saracen's Head Hotel), 2.15 p.m.

April 4th.—North of England Division, B.V.A., Dance in aid of the V.V.B.F., at the Park Hotel, Tynemouth.

April 5th.—Annual Dinner of the B.R.X. Club, at the Royal Veterinary College, N.W.1, 7 p.m.

April 9th.—Meeting of the Association of Veterinary Teachers and Research Workers, at the Royal Veterinary College, London, N.W.1, 10 a.m.

April 9th.—Meeting of the Lancashire Division, B.V.A., at Warrington (Council Chamber, Town Hall), 2.30 p.m.

June 4th.—109th Annual General Meeting of the Royal College of Veterinary Surgeons, at 10, Red Lion Square, London, W.C.1, 12 noon.

June 4th.—Annual General Meeting of the Victoria Veterinary Benevolent Fund, at 10, Red Lion Square, London, W.C.1,—immediately following the above.

June 4th to 6th.—Meetings of Committees and Council, R.C.V.S., at 10, Red Lion Square, London, W.C.1.

Sept. 8th—13th.—Seventieth Annual General Meeting and Congress of the British Veterinary Association, at Harrogate.

B.V.A. Quarterly Meetings in Edinburgh

The following are the arrangements for the quarterly meetings of the British Veterinary Association to be held in the Royal (Dick) School of Veterinary Studies, Edinburgh, on April 29th and 30th, and May 1st:—

Tuesday, April 29th:
12 noon. Home Appointments Committee.
2.15 p.m. Veterinary State Medicine Committee.

Wednesday, April 30th:
10.30 a.m. Organising Committee.
12 noon. Parliamentary and Public Relations Committee.
2 p.m. General Purposes and Finance Committee.

Thursday, May 1st:
10 a.m. Council.

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PERSONAL

MR. H. T. MATTHEWS' APPOINTMENT IN THE UNIVERSITY OF CAMBRIDGE

It is announced that Mr. Hugh Trevor Matthews, B.V.Sc., F.R.C.V.S., D.V.H., has been elected to the Readership in Animal Health in the Department of Veterinary Clinical Studies in the University of Cambridge, with tenure of office as from April 1st.

Mr. Matthews' occupancy of a post in Professor Pugh's Department in the University of Cambridge, welcome as it will be to his new colleagues, will mark the termination of a successful career in the Veterinary Public Health Service, where both Mr. Matthews himself and his work have been held in high esteem. Born in 1895, he was educated at Caldy Grammar and Grove Park Schools, and entered the Liverpool University Medical School in 1913. After the 1914-18 war, during which he served with the R.A.M.C., the Cheshire Yeomanry, the R.F.C. and the R.A.F., H. T. Matthews pursued his veterinary studies at Liverpool, qualifying in 1922 and also securing the B.V.Sc. (Liv.) and the D.V.H. He took his Fellowship, R.C.V.S. in 1928.

After a period in general practice, in 1923 he entered the service of the Liverpool Corporation as Assistant Veterinary Officer, being promoted Deputy Chief in 1932 and Chief Veterinary Officer four years later. During this time his abilities had received further recognition in his appointment as Lecturer in the University of Manchester. Mr. Matthews came south, as Superintending Inspector to the Ministry of Agriculture, with the transfer of veterinary functions from the local authorities to the Ministry in 1938.

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Mr. and Mrs. J. R. Barker.—On the *Orcades*, when she sailed last week, were Mr. and Mrs. J. R. Barker, of Hereford, who are on a six months visit to Australia and New Zealand. The commencement of our Harrogate Congress coincides with the date of their return, as we all hope, to participate.

Births.—Brown.—On March 19th, 1952, at Abingdon, to Pauline (*née* White) Brown, M.R.C.V.S., wife of Kenneth Brown, M.R.C.V.S., a son—Alan.

Errington.—On March 21st, 1952, at the Somerville Nursing Home, Hereford, to Dulcie, wife of A. E. Errington, M.R.C.V.S., a son, Richard Edward, a brother for Lynne.

Lloyd.—On February 29th, 1952, at the Maternity Hospital, Cambridge, to Teresa, wife of J. R. Lloyd, M.R.C.V.S., D.V.S.M., a son—Alan William.

Renwick.—On March 6th, 1952, at Johore Bahru, Federation of Malaya, to Mary, wife of Charles C. Renwick, a son—David Alistair.

Wilson.—On March 18th, 1952, at Somerleigh Nursing Home, Wimborne, Dorset, to Chris (*née* Potter), wife of John C. Wilson, M.R.C.V.S., a daughter—Vanessa Ruth.

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Forthcoming Marriage.—Loftus—Wilson.—The engagement is announced between Anthony Cole Loftus, M.R.C.V.S., younger son of Colonel E. A. Loftus, O.B.E., T.D., D.L., and Mrs. Loftus, of "Polwicks," West Tilbury, Essex, and Esther Evelyn Wilson, Q.A.R.N.N.S., youngest daughter of Mr. and Mrs. R. Wilson, of "Guilcagh," Portlaw, County Waterford, Ireland.

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R.C.V.S. OBITUARY

Conchie, John Wright, F.R.C.V.S., 30, Station Hill, Kidderminster, Worcs. Graduated London, July 13th, 1898; Fellowship May 13th, 1916. Died March 5th, 1952.

Gamble, Henry, O.B.E., F.R.C.V.S., Lt.-Colonel R.A.V.C. (retd.). Graduated London, December 12th, 1898; Fellowship May 15th, 1909. Died at his residence, Instow, N. Devon, February 3rd, 1952.

Verney, Frank Arthur, C.B.E., F.R.C.V.S., Mountain View, Kokstad, South Africa, late Principal Veterinary Surgeon and Director of Agriculture for the Protectorate of Basutoland. Graduated London, July 25th, 1896; Fellowship March 7th, 1905. Died March 16th, 1952; aged 78 years.

Walker, Joseph Blake, O.B.E., Capt. late R.A.V.C. (T.F.), Monks Pond Cottage, Binfield, near Bracknell, Berks. Graduated London, November 9th, 1898. Died March 18th, 1952; aged 74 years.

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Mr. J. W. Conchie, F.R.C.V.S.

Mr. J. Wright Conchie, whose death after a long period of ill health we record above with much regret, succeeded to his uncle's practice in Kidderminster and remained there all his life. Up to the outbreak of war, Mr. Conchie was a regular attendant at the N.V.M.A. Congresses where he was a well-known figure. In 1931 he was elected President of the Midland Counties V.M.A. Mr. Conchie leaves a widow and one son.

The funeral took place at Kidderminster Cemetery on March 8th. Among the mourners were Mr. and Mrs. G. H. Leader, Mr. H. W. Dawes and Mr. W. L. Dwerryhouse, who represented the Midland Counties V.M.A., of which he is President.

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The Late William David Rees, J.P., M.R.C.V.S.

An Appreciation

Dr. William Scott, F.R.C.V.S., of Fryern Hall, Bridgwater, Somerset, writes:—

It was with deep regret I noted the passing of Mr. Rees, a friend of mine of 33 years' standing. Our friendship began by the formation of the Mid-West and South Wales Veterinary Medical Association when I put out a "feeler" to several practitioners with the view of starting a Veterinary Society in the mid-West. The response was most encouraging but none more so than from the pen of W. D. Rees. He proved himself a tower of strength to the mid-West, for he was a man of matured judgment and when at the meetings he rose to speak his remarks always carried authority and were listened to with rapt attention.

Endowed with a charming personality, his actions were ever straightforward and his outlook, tolerant as it was, was that of one ever ready to uphold the dignity of the profession against all odds. His character was permeated by an unaffected simplicity and a complete absence of sophistication.

The last time we met was at the "National" meeting at Cardiff last year and I remember we wandered to a quiet corner and there discussed things, past, present and to come. On looking back along the "vista" of years we both agreed one thing is certain: the horse age must ever take priority over the motor era, and our lament at the passing of the horse lay heavily upon us.

Rees has passed through the "golden gate" and we his friends and the profession are the poorer by his passing. Service was his watchword and on his escutcheon might suitably be inscribed those words, "a valiant knight, he has won his spurs."

GENERAL OBITUARY

Dr. Marshall Findlay

Dr. G. W. M. Findlay, C.B.E., D.SC., M.D., F.R.C.P., whose death was recently reported, was widely known through his writings on tropical medicine and chemotherapy and as the editor of the British Medical Association's abstracting service.

George William Marshall Findlay, the son of George Findlay, M.A., M.D., was born at Brailes, Warwickshire, on January 6th, 1893. He graduated M.B., Ch.B., at Edinburgh in 1915 and entered the Royal Navy as a temporary Surgeon-Lieutenant. On his return to civil life he obtained a Carnegie Research scholarship and in 1920 the degree of M.D. (with gold medal). In the same year he was appointed Lecturer in pathology in the University of Edinburgh and Assistant Pathologist to the Royal Infirmary. During this period he was awarded the Freedland Barbour and Lister Research Fellowships and in 1922 the degree of D.Sc.

In 1923 he was appointed Alice Memorial Fellow and Assistant in the laboratories of the Imperial Cancer Research Fund. From 1929 to 1946 he was on the staff of the Wellcome Bureau of Scientific Research (afterwards the Wellcome Laboratories of Tropical Medicine) under the direction of the late Dr. C. M. Wenyon where he became an acknowledged authority on yellow fever. In this capacity he was frequently, from 1932 onwards, consulted by the Colonial Office and made numerous visits to North and West Africa. He was made a C.B.E. in 1935 and from 1942 to 1946 he was Consulting Physician in tropical medicine to the West African Forces with the rank of Brigadier. In 1941 he obtained the M.R.C.P. and in 1948 was elected F.R.C.P. In 1946 he joined the staff of the British Medical Association as first editor of the important new publications *Abstracts of World Medicine* and *Abstracts of World Surgery, Gynaecology and Obstetrics* and this position he occupied until his death. He was for many years on the Council of the Royal Microscopical Society and served as its President for the period 1950-51. Dr. Findlay was the author of numerous scientific papers on deficiency diseases, tropical medicine and pathology, and of one important book, *Recent Advances in Chemotherapy*.

A Tribute

J. T. E. writes:

The late Dr. Marshall Findlay was well known to a considerable body of veterinary research workers; and during his long employment on the Wellcome Bureau of Scientific Research, from 1929 to 1946, he came into close contact with several of them, especially those engaged in research into the virus diseases. In that field of work he was remarkable for the large number and variety of the problems he took up for study and for his copious writings, with a wide erudition, and rapidly developing fine historical sense. Even when his work was primarily concerned with diseases of the human subject, as in the case of yellow fever (upon which he was a pioneer worker), he showed an extraordinary sense of the value of comparative study; so that in the case of that infection, for example, he was able to elicit, from the immune responses of cattle and other animals, that carriers (in which the virus was clinically harmless) possibly existed in large extents of territories even outside the confines of those areas in which the dread human disease was known to occur. He took up for further study also many infections recognised most particularly for the severity of their clinical effects upon animals, such as, for example, the Rift Valley fever of Kenya. Probably, however, his name will be perpetuated in the annals of veterinary science mainly for the pioneer work he did with Hindle (lately Director of the Zoological Gardens, Regent's Park) upon feline distemper [Hindle, E., & Findlay, G. M. (1932.) Studies on Feline Distemper. *J. comp. Path.* **45**, 11-26]. That work followed shortly upon Laidlaw and Dunkin's classical work upon canine distemper (reported from 1926 to 1929). Hindle and Findlay were first led to undertake that work through the occurrence of very fatal epidemics among the "lesser cats" in the Gardens of the Zoological Society, and their attention was subsequently directed to the epidemics of "Show fever" which had become a serious problem to cat breeders in this country. They were then able to prove, for the first time, that the primary cause of cat distemper was a filterable virus, which affected severely, in addition to the domestic cat, the leopard, American tiger-cat, African tiger-cat, the rusty tiger-cat, the marbled cat, the caracal lynx, and ocelot, while dogs, ferrets, mongooses, rabbits, guinea-pigs, and mice were insusceptible. The clinical symptoms of feline distemper, as it was well known to veterinary practitioners, were manifested, however, in such protean form, affecting the domestic cat—whether in hyperacute febrile form, or as pulmonary or enteric localisations—that much more difficulty was experienced by practitioners than in the case of canine distemper in accepting the view that feline distemper was of *single* primary origin. Indeed, it has seemed almost certain for many years now in the case of the cat that many viruses are in question, which still remain

to be studied closely—while, in the case of the dog (as we have only recently come to learn), the problem is by no means the single, simple, one which most practitioners were tempted to conclude it was in the years immediately following the Laidlaw-Dunkin researches.

Dr. Findlay's standing in this country in the rapidly expanding subject of virology was testified by his membership of the enlarged Foot-and-Mouth Disease Research Committee of the Ministry of Agriculture and Fisheries, just before the second World War. There, in 1939, he, with the late Sir Joseph Arkwright and Sir Patrick Laidlaw, comprised the panel of virus experts on the selection sub-committee which recommended the appointment of a Superintendent (later Director) and subsequently led to the staffing of the Pirbright Research Station on a satisfactory, permanent basis.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Ches.—Cross Lanes Farm, Stapleford, Tarvin, Chester (Mar. 17th).
Derbys.—Cuckoostone Grange, Matlock Moor, Matlock (Mar. 14th); Mosley Farm, Wormhill, Buxton (Mar. 17th).
Kent.—Leacon Farm, Charing, Ashford (Mar. 17th); Lower Deans Farm, Harrietsham, Maidstone (Mar. 20th).
Lancs.—Burgh Hall Farm, Chorley (Mar. 18th).
Leics.—Seagrove Road Farm, Sileby, Loughborough (Mar. 20th).
Salop.—Lyncal Lodge, Loppington, Shrewsbury (Mar. 20th).
Surrey.—Oaks Farm, Croydon Lane, Banstead (Mar. 19th); Slough Farm, Slough Lane, Headley, Epsom (Mar. 20th).
Westmorland.—West View, Endmoor, Kendal (Mar. 15th).

FOOT-AND-MOUTH DISEASE:

Cambs.—Bank Farm, Soham Fen, Ely (Mar. 23rd).
Hants.—Breech Farm, St. Mary Bourne, Andover, Hants (Mar. 23rd).
Kent.—Stonecross Farm, Sandwich (Mar. 21st).
Suffolk (E.).—Lodge Farm, Foxhall, Ipswich (Mar. 20th); Tothill and Fishponds Farms, Haughley, Stowmarket (Mar. 24th).
Suffolk (W.).—Flempton Hall Farm, Flempton, Bury St. Edmunds (Mar. 22nd).

FOWL PEST:

Essex.—Haxwells Farm, Abberton, Colchester (Mar. 22nd).
Norfolk.—16, Ringers Lane, Hingham, Norwich (Mar. 21st).
Lincs (Kesteven).—Four Winds Poultry Farm, Wellingore Heath, Lincoln (Mar. 19th).
Warwicks.—The Dell, Peterbrook Road, Warstock, Birmingham (Mar. 19th); Bromson Hill Farm, Leamington Spa (Mar. 22nd).

SWINE FEVER:

Cambs.—4, The Terrace, Horseheath (Mar. 19th).
Durham.—Durham Road Allotments, Stockton-on-Tees (Mar. 19th).
Herts.—Home Farm, Fanhams, Nr. Ware (Mar. 17th).
Kent.—Glen Wood, Woodsell Lane, Ash, Sevenoaks (Mar. 19th).
Lancs.—Craven Heifer Farm, Pale Lane, Darwen; Kesters Farm, Chapel Lane, Longton, Nr. Preston; Edge House, Edge Lane, Stretford, Manchester (Mar. 17th); Wyne Hall Farm, St. Michael's, Preston; Crabtree Farm, Inskip, Preston (Mar. 18th); Brindle Hall Farm, Clifton Road, Marton, Blackpool; Rose Farm, Kirkham Road, Freckleton, Preston (Mar. 20th); Lower Trimshaw Fold Farm, Eccleshill, Darwen (Mar. 22nd).
Leics.—White Horse Farm, Heather (Mar. 19th); Barton Road, Congerstone, Nuneaton (Mar. 21st).
Lincs (Holland).—Catlin's Farm, Sutton St. James, Spalding (Mar. 21st).
Norfolk.—Northacre, Caston, Attleborough (Mar. 19th); Hall Farm, East Winch, Kings Lynn (Mar. 21st).
Northants.—Horne Farm, Delapré, Hardingstone (Mar. 19th).
Salop.—Brooklands, Wrockwardine Road, Wellington (Mar. 18th).
Staffs.—Gailey Lea, Gailey, Penkridge (Mar. 19th); Churchfield House, Church Vale, West Bromwich (Mar. 22nd).
Sussex (E.).—Beeney's Piggeries, Lattbridge Drove, Eastbourne; Little Radfords, Tinsley Green, Crawley (Mar. 21st).
Warwicks.—35, Wall Hill Road, Brownshill Green, Coventry (Mar. 18th); Booth's Farm, Monmouth Drive, Sutton Coldfield; 40, Slade Avenue, Hall Green, Birmingham (Mar. 20th); Turfpits Lane, Roughly, Sutton Coldfield (Mar. 22nd).
Yorks (W.R.).—Wiley Brig Allotments, Dormanstone (Mar. 19th).

ANIMAL REPRODUCTION AND ARTIFICIAL INSEMINATION

SECOND INTERNATIONAL CONGRESS IN ROME

The Second International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination will be held in Copenhagen from July 7th to 11th, 1952.

The Congress is being arranged by the International Standing Committee on Physiology and Pathology of Animal Reproduction and of Artificial Insemination, which has appointed Dr. John Hammond, Cambridge, President, Professor Nils Lagerlof, Stockholm, Vice-President, and Professor Ed. Sorenson, Copenhagen, Secretary-General. The following three topics will be discussed at the Congress:—

1. Physiology of Reproduction.
2. Pathology of Reproduction.
3. Artificial Insemination of Domestic Animals.

The provisional programme is reproduced below. A detailed programme may be obtained from the Secretariat of the Congress at the following address: The Royal Veterinary and Agricultural College, 13, Bulowsvej, Copenhagen, V.

Simultaneously with the conference a large horse and cattle show, together with a vocational exhibition, will be held at Bellahoj, Copenhagen. Excursions also will be arranged.

PROVISIONAL PROGRAMME

Sunday, July 6th, 8 p.m.—Reception by the Municipality of Frederiksberg.
Monday, July 7th, 9 a.m.—Inaugural Meeting. The Plenary Meeting will commence immediately after the Inaugural Meeting.
3 p.m.—Sectional Meetings.
Tuesday, July 8th, 9 a.m.—Plenary Meeting.
3 p.m.—Sectional Meetings.
9 p.m.—Minor Festival at the Royal Veterinary and Agricultural College.
Wednesday, July 9th, 8.30 a.m.—Excursion.
9 p.m.—Town Hall Festival, Copenhagen.
Thursday, July 10th, 9 a.m.—Plenary Meeting.
2 p.m.—Sectional Meetings.
Friday, July 11th, 9 a.m.—Plenary Meeting of the VI International Domestic Animal Production Congress.
2 p.m.—Reception at the Bellahoj Cattle Show.
4.30 p.m.—Closing Meeting.
7.30 p.m.—Closing Banquet.

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EXPERIMENTS IN PIG FEEDING

Experiments being conducted by British scientists may enable pig breeders to save animal protein feeding-stuffs by including a small percentage of antibiotics in the pigs' diet.

Lord Rothschild, Chairman of the Agricultural Research Council, referring to these experiments at a Press conference in London, said it was hoped to be able to give a definite decision on the results by the end of the year.

Among antibiotics being tested are procaine, penicillin, aureomycin, and vitamin B_{12}.

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Dishorning of Adult Cattle

Erratum.—In the above section of the article on dishorning published in our last issue (March 22nd), the first two sentences of paragraph 2, column 1, page 173, should read as follows:—

"When using cornual nerve block and a butcher's saw, it is usual to cut from above downwards and outwards including a one-quarter inch margin of the epidermis at the base of the horn. With the animal in a recumbent position the opposite direction for removal is preferable."

Those interested are requested to alter their copies of this article accordingly.

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Foot-and-Mouth Disease

In addition to those notified in another column, outbreaks of foot-and-mouth disease have since been confirmed at Oxted, Surrey, and at Mersham, Kent.

At a meeting of the Suffolk Branch of the National Farmers' Union, held at Ipswich on Tuesday last, it was agreed to urge N.F.U. Headquarters to ask the Ministry of Food to work out a scheme for the emergency slaughter of cattle unable to leave farms for distribution and slaughter because of outbreaks of foot-and-mouth disease.

It was stated that veterinary officers of the Ministry of Agriculture had analysed separately the recent outbreaks in Suffolk, and in some cases there was little doubt that the infection had been carried from France. Starlings are suspected of spreading the disease.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

OEDEMA DISEASE OF SWINE

Sir,—During recent weeks there have been several letters under the above heading expressing a variety of views on the intriguing disease. This condition has been under investigation at this laboratory and some of our recent findings may be of general interest. As has already been indicated, we have confirmed the findings of Timoney (*Vet. Rec.* **62.** 748) regarding the transmission of the disease by the intravenous injection of the supernatant fluid from the centrifuged small intestine contents harvested from field cases of the disease. In addition, we have succeeded in reproducing what seems to be the typical syndrome by making an extract of the oedematous portion of the stomach wall, centrifuging this extract at 2,800 r.p.m. and injecting the supernatant fluid intravenously. We have also succeeded in filtering the supernatant fluid from the centrifuged contents of the small intestine through Chamberland L.3 filters and by inoculating this filtrate intravenously we have reproduced the condition.

In our experimental transmission typical symptoms may appear soon after inoculation or in some cases they may be delayed for 24 hours. The disease progresses rapidly and by 48 to 72 hours the pigs are *in extremis* and death supervenes. So far we have not succeeded in transmitting the disease serially from our experimental cases. It appears, therefore, that in oedema disease in swine there is an inciting substance present in the oedematous stomach wall and in the contents of the small intestine. Apparently this substance can pass intact through Chamberland filters. It has not yet been established whether the particular substance is present in other tissues.

We are interested in the claims made for vitamin B_1 in the control of the condition. So far we have not had enough experience in the use of this preparation to express an opinion as to its value. The evaluation of positive therapeutic results in this disease is very difficult in the absence of adequate controls, and we have had recoveries even in the absence of any treatment. While keeping an open mind on the part vitamin B_1 deficiency may play in precipitating the disease the results referred to above indicate that the ultimate cause is not a simple vitamin deficiency.

We agree with Messrs. Beaumont and Barr that a change of feeding and/or environment is very often associated with outbreaks, but this is by no means an invariable rule and recently we have had knowledge of the disease in seven successive litters farrowed and reared on one farm. Atypical outbreaks are seen from time to time. Recently we were asked to investigate an outbreak of lameness in a pen of pigs. Several showed a marked lameness involving a hind limb and affected pigs hobbled about on three legs. Handling did not evince any pain but it was possible to palpate an area of oedema on the outer aspect of the gluteal muscles. Oedema disease was confirmed at *post-mortém* examination and we succeeded in trasmitting the typical condition experimentally from this outbreak. In our experience the disease is not necessarily associated with the feeding of a very wet ration as suggested by Mr. Barr. We have seen outbreaks under almost all conditions of pig keeping including dry feeding.—Yours faithfully, D. Luke, J. F. Gracey and W. A. M. Gordon, Ministry of Agriculture for Northern Ireland, Veterinary Research Division, The Farm, Stormont, Belfast.

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Sir,—Mr. Barr's description of his cases of oedema disease in pigs in the March 15th issue of *The Veterinary Record* prompts me to record the facts concerning our one and only case so far encountered at the National Pig Litter Testing Station, Stoke Mandeville:—

1. The pigs were dry fed, good quality meals being available *ad lib.*, water being supplied by a separate drinker (Fordham).

2. Four pigs, a half litter, were in the hut concerned, but only one of them became affected.

Mr. Barr considers that the use of antibiotics in the treatment of this condition is "totally irrational," the clinical and *post-mortem* picture not being suggestive of a toxaemia. It is difficult to reconcile this statement with the work of Timoney in Dublin, whose researches suggest quite the contrary.

3. Our pig, though comatose and paralysed, did respond to treatment with antibiotics.—Yours faithfully, W. P. Blount, The British Oil and Cake Mills, Ltd., 2, Kingscote Street, London, E.C.4. *March 18th*, 1952.

SODIUM PROPIONATE IN VETERINARY THERAPEUTICS

Sir,—Mr. D. D. Ogilvie's letter in connection with sodium propionate (*Vet. Rec.*, March 1st, 1952) contains statements which appear to me to be at variance with published data.

It is probable that Mr. Ogilvie is an investigator skilled in veterinary pharmacology and bacteriology and therefore I am not presuming to cross swords with him in his own specialised field. Indeed, I must thank him for his interesting comments since my experience is mainly clinical and Mr. Ogilvie's letter has supplied the necessary stimulus to make me look further afield.

I have lately been able to consult references on sodium propionate and they do not appear to agree with the observations made by Mr Ogilvie. For example, many clinicians refer to the efficiency of propionate in the treatment of fungal infections of the vulvovaginal areas (Alter *et al.*, 1947, *Amer. J. Obst. & Gynec.* **53.** 241; Davids & Kurtin, 1949, *Ibid.* **58.** 397), of the skin (Keeney *et al.*, 1944, *Bull. Johns Hopkins Hosp.* **75.** 417; Peck & Russ, 1947, *Arch. Dermat. & Syph.*, **56.** 601; Hopkins *et al.*, 1946, *J. Invest. Dermat.* **7.** 239) and of other tissues. Perrin (1951, *J. Amer. Pharm. Assoc.* **12.** 568) suggests that failures in fungous infections are due mainly to incorrect use.

According to Heseltine and Galloway (1951, *J. Pharm. Pharmacol.* **3.** 581), sodium propionate is not active *in vitro* at high dilution, since few important pathogens are inhibited by less than 0·7 per cent. when enriched media are used. It should be emphasised, moreover, that my paper (1952, *Vet. Rec.* **64.** 95) is concerned mainly with bacterial infections and it is noteworthy that Theodore (1949, *Arch. Ophthal.* **41.** 83; 1950, *J. Amer. Med. Assoc.* **143.** 226) obtained extremely satisfactory results in about 1,200 ocular cases, the majority of which were due to bacteria.

Mr. Ogilvie's comment regarding deep invasion of the hair follicles is important, but several investigators, including some quoted above, have reported good results with propionates in the treatment of human tinea capitis. My communication was not intended to include every aspect of sodium propionate therapy and, as remarked in my discussion, it is hoped that further, controlled trials will be undertaken in due course. The results achieved by other investigators and myself, however, do indicate that sodium propionate is an effective therapeutic agent, although Mr. Ogilvie's letter gives a different impression.—Yours faithfully, S. J. Tucker, 409, Greenford Road, Greenford, Middlesex. *March 13th*, 1952.

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STERILITY IN CATTLE

Sir,—The health of the cattle of England has never been as good as it is at the present, but never has sterility been so rampant; consequently, what we have gained on the one hand we have lost on the other. This sterility ought to be priority No. 1 because if something is not done, and done immediately, we shall soon be short of milk and calves. Last week I was called in to inspect three farms because of sterility; all of these are using bulls and at one the bull cost £500 a few months ago. Two of the farms had one cow each in calf: at the other all the 10 cows were barren. These farms had been using the local A.I. centre but had gone back to the bull. In my opinion all V.I. centres should have a Sterility Officer as I am certain that there is ample work for him.

How matters are in the dairying districts I do not know, but in my non-dairying area the problem is serious. I have tried all the various luteinising hormones, but without success, and never in my life have I experienced such a calamity. I remember that at one time abortion was so bad that we advised farmers not to calve any cows on their farms for 12 months so that the disease would "die a natural death," but we never had sterility on such a scale as we have at the present time.

May I urge that this matter be taken up officially and immediately, otherwise the profession is going to lose its good name.—Yours faithfully, G. C. Lancaster, Eastwick House, Evesham, Worcs.

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A COW THAT DIED OF BROKEN HEART

Sir,—The late Mr. Gladstone Mayall, Sub-Editor of *The Veterinary Journal*, advised the writer and other colleagues to rest our minds sometimes by reading books other than those dealing with purely veterinary matters. To-day I wish to recommend busy practitioners, as well as those "chasing bugs" (to use an American term for bacteriologists), to read "Conference at Cold Comfort Farm" by Stella Gibbons (Longmans 7s. 6d.) and to see ourselves as others see us, especially the members serving the Ministry of Agriculture. Here is Adam Lambsbreath explaining how Feckless the cow died of shame when to-day's fetish of artificial insemination engulfed her spouse Big Business: "T'was th' black-hearted Ministry as did send th' scientific gents to Cold Comfort; an' who dare say th' Ministry nay? Ay, an' the gents di' be-dottle Mus' Micah an' Mus Reuben wi' flatterin'. They says they has a Awful Responsibility. (I hears 'em). Reely superior beasties (they says, argyfyin' like) should spread their influence. An' what wi' the Ministry an' what wi'

being puffed up wi' vanity Mus' Reuben an' Mus' Micah they lets our Big Business go. An' twere the shame o' it (him havin' kept his affairs private up till then) as did break our Feckless' lovin' heart."—Yours faithfully, EDWARD MORGAN, Valencia, Venezuela. *March 12th*, 1952.

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IDENTIFICATION OF BOVINE ANIMALS: TATTOOING

Sir,—I was very interested in the report of the R.C.V.S. Identification of Bovine Animals Committee published in the Supplement to *The Veterinary Record* of January 19th. The necessity for obtaining a satisfactory method of identification of cattle, following the increase in the tuberculosis eradication scheme and in the number of pedigree and recorded herds, has become imperative. Faulty identification of an animal can lead to endless trouble and expense both for the owner and for the veterinary surgeon.

In that part of the report dealing with various methods of identification, paragraph 5, tattooing, stated: "The ears should be marked with the mark in the horizontal position between the two ribs of the cartilage, and sufficiently far from the outer edge to be placed in an area which is free from hair." Having been mainly on the "receiving end" of many thousands of earmarks, good, bad, or indifferent, it has always appeared to me that the siting is of prime importance. Marks inserted on the suggested site, while effective in many cases, do not seem to be as satisfactory as they might. The apparent reason is that in many animals the ribs of the ear are either too close or too prominent to allow of equal penetration of all the tattooing needles, no matter how careful one has been in getting the number horizontally between the ribs. The result is that in many cases the top and/or the bottom of the number is distorted by these ridges and eventually part of the number becomes indecipherable.

The position which seems to be most satisfactory is midway between the top edge of the ear and the upper rib, and sufficiently far from the edge to avoid all hair. This site is comparatively flat in section and, as a rule, appears to be less pigmented than any other part of the ear. It is of importance that the tattooing instrument be used from the top edge of the ear downwards, as it is impossible to reach this site from the outer or lower edge and still keep the number horizontal. The numbers are inserted in the forceps by holding the head of the forceps with the handles pointing away from one and putting the numbers in as usual. It is usual at first to try out the number on a piece of paper to ensure that it is correct.

This method is used by many veterinary surgeons, by members of the Breed Societies, by owners of tuberculin tested non-pedigree herds, and by many of the other milk recorders. When correctly done the results are very seldom lacking in legibility or durability. I should be interested to learn what are the experiences of other members on this matter, as, having had much difficulty in attempting to read unsatisfactory earmarks, it appears to me imperative that there should be, as far as possible, some standardisation of site and technique.—Yours faithfully, ALEXANDER W. SMITH, Callander, Bath Road, Sonning, Nr. Reading. *March 18th*, 1952.

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A RECENT COURT ACTION

Sir,—Through the columns of *The Veterinary Record* I would like to express my appreciation of the help afforded to me by the National Veterinary Benevolent and Mutual Defence Society in a recent court action. In my opinion the circumstances of the case and the findings of the court are worthy of some consideration by the profession in general.

Briefly the facts were as follows: a dog, a wheaten Scottish terrier, was brought to me by the owner who stated that its mouth was in a bad condition. I examined the animal's mouth, agreed with the owner and advised that the dog be left with me to be given an anaesthetic and I would do what was necessary to clean up its mouth. To this the owner agreed, if not in actual words, then at least by the fact that she left the dog. An anaesthetic was administered and I started to scale the teeth. In the course of this two of the teeth fell out and a number of others, 13 in all, were found to be badly affected with pyorrhoea and these I extracted. The result of this, which must be an everyday occurrence in veterinary practice, was that the owner sued me for £100 which was alleged to be the value of the dog when she brought it to me.

The defence put forward by my Counsel was restricted to establishing that before the dog was brought to me it had pyorrhoea to such an extent as to render it valueless for show purposes and that the proper treatment for pyorrhoea being extraction, then the patient had been dealt with in the only way possible. The Judge, in his comment, stated that it had been proved to his satisfaction that the dog did in fact have pyorrhoea and it followed that its value before the operation was in no way greater than its value after the extraction of the teeth. One would think that the case should finish at that, my client having sued for loss of value which did not in fact occur. However, the Judge ruled that express instructions had not been received from the owner and that the teeth had been extracted without authority; he therefore granted the owner £10 damages and costs.

In the light of these findings one can imagine countless cases where explicit instructions have not been obtained and in fact could not possibly have been obtained because at the initial examination the whole extent of the trouble was not evident. Is a surgeon justified in assuming that if he offers to do what is necessary then he has a free hand so to do, or must he in each and every case stop in the middle of the operation, advise the owner of the severity of the condition and receive instructions to proceed?—Yours faithfully, THOMAS C. DENHOLM, 63-65, Ilkeston Road, Nottingham. *March 12th*, 1952.

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THE VETERINARY SURGEON'S TITLE

Sir,—I have been following the correspondence on the above subject very closely, and note that many veterinary surgeons in this country feel sincerely that the courtesy title "Doctor" should be conferred on an M.R.C.V.S., while there are quite a few who are ardently opposed to such a just claim.

I am one of those who possess the degree of Doctor of Veterinary Medicine (D.V.M.) and hope to be an M.R.C.V.S. in the near future. I intend carrying on my "Doctor" title which was conferred on me by a University.

In this country and colonies and in all other countries where British influence existed politically, a veterinarian came to be called a "Veterinary Surgeon" and a "Mister." This was all right as long as members of our profession did only surgery to cure any diseased condition among animals. Mr. G. V. Short, in your issue of January 5th, 1952, has rightly pointed out the reasons why members of the medical profession took upon themselves the courtesy title "Doctor."

I am convinced in my own mind that this debate "to be or not to be" will go on year after year until the wording of the diploma scroll of a graduate is changed to such a form as automatically would give the courtesy title "Doctor."

Therefore, as a solution to this vexed question, may I suggest that with various universities in the country taking over the regional veterinary colleges, the profession should request the respective university authorities to confer the degree of "Doctor of Veterinary Medicine" on their graduates in Veterinary Medicine instead of a Bachelor's degree. This step will bring the veterinary graduate of this country into line with American and European graduates, and stimulate other parts of the world to follow the same example and bring the profession to the position it deserves.—Yours faithfully, C. PERUMAL PILLAI, Royal Veterinary College, Streatley, Berks. *March 18th*, 1952.

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Sir,—The recent correspondence on the Veterinary Surgeon's title must sound a note of incredulity in the minds of many readers. It is an effort to convince oneself that fellow members of our profession could so yearn the courtesy title of "Doctor." The request does not seem to signify a sense of personal inferiority so much as some lack of faith in our profession.

A man's achievement and not his title is surely his most valuable contribution to the community and to posterity. The perceptible bone of contention perhaps lies in the fact that the medical practitioner—a worthy man—is entitled to the designation of "Doctor" while in many cases he is only the holder of a Bachelor's degree or a diploma. This state of academic qualification is comparable with that of the practising veterinary surgeon. But there is a difference. This is probably a little obscured by the shadows of history. Apparently the only degree of the medical man in the "Old Days" was that of Doctor of Medicine. Thus, academically and otherwise it was right and proper to refer to him as "Doctor." The introduction of the Bachelor's degree came later and with it the obvious difficulty of distinguishing by title between the older and new practitioner. Regrettable though it may seem to some, our title has no such academic history.

In the United States the title of Doctor is used because the degree of the veterinarian is D.V.M.—Doctor of Veterinary Medicine. This is not the academic arrangement in Great Britain and is contrary to its system. Some fellow beings are ever dissatisfied. Numerous doctors (medical) are this very day striving to be called "Mr." again. This is understandable when one considers those dreadful individuals who may refer to a professional gentleman as "Doc" as if he were an ardent companion of Snow White! It may be stressed that those who proclaim the desire for the title of "doctor" for veterinary surgeons are suggesting that the whole age-old tradition of academic titles in this country be either ignored or radically changed. This appears unnecessary if not irrelevant in a consideration of the status of the veterinary profession.—Yours faithfully, TIMOTHY D. GLOVER, Madingley Hall, Cambridge. March 21st, 1952.